Inventor: Mario H. Skiadopoulos ef al.

Title: ATTENUATED HUMAN-BOVINE CHIMERIC PARAINFLUENZA VIRUS (PIV) VACCINES Page 1 of 27

ACCAAACAAG AGAAGAGACT TGCTTGGGAA TATTAATTCA AATAAAAATT AACTTAGGAT

Serial No.: 09/900,112 Filing Date: July 5, 2001

SEQ ID NO: 35

TAAAGAACTT TACCGAAAGG TAAGGGGAAA GAAATCCTAA GACTGTAATC ATGTTGAGTC 120 TATTCGACAC ATTCAGTGCG CGTAGGCAGG AGAACATAAC GAAATCAGCT GGTGGGGCTG 180 TTATTCCCGG GCAAAAAAC ACTGTGTCTA TATTTGCTCT TGGACCATCA ATAACAGATG 240 ACAATGATAA AATGACATTG GCTCTTCTCT TTTTGTCTCA TTCTTTAGAC AATGAAAAGC 300 AGCATGCGCA AAGAGCTGGA TTTTTAGTTT CTCTGTTATC AATGGCTTAT GCCAACCCAG AATTATATTT AACATCAAAT GGTAGTAATG CAGATGTTAA ATATGTTATC TACATGATAG 420 AGAAAGACCC AGGAAGACAG AAATATGGTG GGTTTGTCGT CAAGACTAGA GAGATGGTTT 480 ATGAAAAGAC AACTGATTGG ATGTTCGGGA GTGATCTTGA GTATGATCAA GACAATATGT 540 TGCAAAATGG TAGAAGCACT TCTACAATCG AGGATCTTGT TCATACTTTT GGATATCCAT 600 CGTGTCTTGG AGCCCTTATA ATCCAAGTTT GGATAATACT TGTTAAGGCT ATAACCAGTA 660 TATCAGGATT GAGGAAAGGA TTCTTTACTC GGTTAGAAGC ATTTCGACAA GATGGAACAG 720 TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT 780 CCCAACAGAG CTTGGTAACA CTCATGGTTG AAACACTGAT AACAATGAAC ACAGGCAGGA 840 ATGATCTGAC AACAATAGAA AAGAATATAC AGATTGTAGG AAACTACATC AGAGATGCAG 900 GTCTTGCTTC ATTTTTCAAC ACAATCAGAT ATGGCATTGA GACTAGAATG GCAGCTCTAA 960 CTCTGTCTAC CCTTAGACCG GATATCAACA GACTCAAGGC ACTGATCGAG TTATATCTAT 1020 CAAAGGGGCC ACGTGCTCCT TTTATATGCA TTTTGAGAGA TCCCGTGCAT GGTGAGTTTG 1080 CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGTT GTACAAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTGG GGGTCACACA AGAAGCCAAG CAAAGCTTGA AGAAACACAT GAAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAAGAAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATCCATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACACA AATCAAACTG 1620 1680 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1740 GACAAATCCA GAATCCAACC ACAACTCAAT CAACCAAAGA TTCATGGAAG ACAATGTTCA 1800 AAACAATCAA ATCATGGATT CTTGGGAAGA GGGATCAGGA GATAAATCAT CTGACATCTC 1860 ATCGGCCCTC GACATCATTG AATTCATACT CAGCACCGAC TCCCAAGAAA ACACGGCAGA 1920 CAGCAATGAA ATCAACACAG GAACCACAAG ACTTAGCACG ACAATCTACC AACCTGAATC 1980 CAAAACAACA GAAACAAGCA AGGAAAATAG TGGACCAGCT AACAAAAATC GACAGTTTGG 2040 GGCATCACAC GAACGTGCCA CAGAGACAAA AGATAGAAAT GTTAATCAGG AGACTGTACA 2100 2160 GGGAGGATAT AGGAGAGGAA GCAGCCCAGA TAGTAGAACT GAGACTATGG TCACTCGAAG AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAGG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340 2350 **TGATGATGGA**

FIGURE 1A

Deeket No.! NIII-0127
Inventor: Mario H. Skiadopoulos e ar
Title: ATTENUATED HUMAN-BOVINE
CHIMERIC PARAINFLUENZA VIRUS (PIV)
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AGAGGCCTGG	AATCTATCAG	TACATTTGAT	TCAGGAT ATA	CCAGTATAGT	GACTG CCGCA	2410
ACACTAGATG	ACGAAGAAGA	ACTCCTTATG	AAGAACA ACA	GGCCAAGAAA	GTATC AATCA	2470
ACACCCCAGA	ACAGTGACAA	GGGAATTAAA	AAAGGGG TTG	GAAGGCCAAA	AGACA CAGAC	2530
AAACAATCAT	CAATATTGGA	CTACGAACTC	AACT TCAAAG	GATCGAAGAA	GA GCCAGAAA	2590
ATCCTCAAAG	CCAGCACGAA	TACAGGAGAA	CCAACAA GAC	CACAGAATGG	ATCCC AGGGG	2650
AAGAGAATCA	CATCCTGGAA	CATCCTCAAC	AGCGAGA GCG	GCAATCGAAC	AGAAT CAACA	2710
AACCAAACCC	ATCAGACATC	AACCTCGGGA	CAGAACC ACA	CAATGGGACC	AAGCA GAACA	2770
ACCTCCGAAC	CAAGGATCAA	GACACAAAAG	ACGGATGGA A	AGGAAAGAGA	GGACACA GAA	2830
GAGAGCACTC	GATTTACAGA	AAGGGCGATT	ACATTAT TAC	AGAATCTTGG	TGTAA TCCAA	2890
TCTGCAGCAA	AATTAGACCT	ATACCAAGAC	aagagag ttg	TGTGTGTGGC	GAATG TCCTA	2950
AACAATGCAG	ATACTGCATC	AAAGATAGAC	TTCCTAG CAG	GTTTGATGAT	AGGAGT GTCA	3010
ATGGATCATG	ATACCAAATT	AAATCAGATT	CAGAACG AGA	TATTAAGTTT	GAAAA CTGAT	3070
CTTAAAAAGA	TGGATGAATC	ACATAGAAGA	CTAATTG AGA	ATCAAAAAGA	ACAAT TATCA	3130
CTGATCACAT	CATTAATCTC	AAATCTTAAA	ATTATGA CAG	AGAGAGGAGG	GAAGA AGGAC	3190
CAACCAGAAC	CTAGCGGGAG	GACATCC ATG	ATCAAGACAA	AAGCA AAAGA	AGAGAAAATA	3250
AAGAAAGTCA	GGTTTGACCC	TCTTATGGAA	ACACAGG GCA	TCGAGAAAAA	CATCC CTGAC	3310
CTCTATAGAT	CAATAGAGAA	AACACCAGAA	AACGACA CAC	AGATCAAATC	AGAAA TAAAC	3370
AGATTGAATG	ATGAATCCAA	TGCCACTAGA	TTAGTAC CTA	GAAGAATAAG	CAGTACAATG	3430
AGATCATTAA	TAATAATCAT	TAACAACAGC	AATTTAT CAT	CAAAAGCAAA	GCAAT CATAC	3490
ATCAACGAAC	TCAAGCTCTG	CAAGAGTGAC	GAGGAAG TGT	CTGAGTTGAT	GGACA TGTTC	3550
AATGAGGATG	TCAGCTCCCA	GTAAACCGCC	AACCAAG GGT	CAACACCAAG	AAAACCAATA	3610
GCACAAAACA	GCCAATCAGA	GACCACCCCA	A TACACCAAA	CCAATCAACA	CATAACAAAG	3670
ATCTCCAGAT	CATAGATGAT	TAAGAAAAAC	TTAGGAT GAA	AGGACTAATC	AATCC TCCGA	3730
AACAATGAGC	ATCACCAACT	CCACAATCTA	CACATTC CCA	GAATCCTCTT	TCTCC GAGAA	3790
TGGCAACATA	GAGCCGTTAC	CACTCAAGGT	CAATGAA CAG	AGAAAGGCCA	TACCTCATAT	3850
TAGGGTTGTC	AAGATAGGA G	ATCCGCCCAA	ACATGGA TCC	AGATATCTGG	ATGTC TTTTT	3910
ACTGGGCTTC	TTTGAGATGG	AAAGGTCAAA	AGACAGG TAT	GGGAGCATAA	GTGAT CTAGA	3970
TGATGATCCA	AGTTACAAGG	TTTGTGGCTC	TGGATCA TTG	CCACTTGGGT	TGGCT AGATA	4030
CACCGGAAAT	GATCAGGAAC	TCCTACAGGC	TGCAACCAA G	CTCGATATAG	AAGTAAG AAG	4090
AACTGTAAAG	GCTACGGAGA	TGATAGTTTA	CACTGTA CAA	AACATCAAAC	CTGAA CTATA	4150
TCCATGGTCC	AGTAGATTAA	GAAAAGGGAT	GTTATTT GAC	GCTAATAAGG	TTGCA CTTGC	4210
TCCTCAATGT	CTTCCACTAG	ATAGAGGGAT	AAAATTC AGG	GTGATATTTG	TGAAC TGCAC	4270
AGCAATTGGA	TCAATAACTC	TATTCAAAAT	CCCTAAGTCC	ATGGCATTGT	TATCA TTGCC	4330
TAATACAATA	TCAATAAATC	TACAAGTACA	TATCAAA ACA	GGAGTTCAGA	CAGAT TCCAA	4390
AGGAGTAGTT	CAGATTCTAG	ATGAAAAAGG	TGAAAAA TCA	CTAAATTTCA	TGGTT CATCT	4450
CGGGTTGATC	AAAAGGAAG A	TGGGCAGAAT	GTACTCAGTT	gaat attgta	AGCAGAAGAT	4510
CGAGAAGATG	AGATTATTAT	TCTCATTGGG	ATTAGTT GGA	GGGATCAGCT	TCCAC GTCAA	4570
CGCAACTGGC	TCTATATCAA	AGACATTAGC	AAGTCAA TTA	GCATTCAAAA	GAGAA ATCTG	4630
CTATCCCCTA	ATGGATCTGA	ATCCACACTT	AAATTCA GTT	ATATGGGCAT	CATCA GTTGA	4690
AATTACAAGG						4700

OT 1 5 2002 60

Doeket No.: NIII-0127
Inventor: Mario H. Skiadopoulos et al.:

Title: ATTENUATED HUMAN-BOVINE
CHIMERIC PARAINFLUENZA VIRUS (PIV)

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Serial No.: 09/900,112 Filing Date: July 5, 2001

SEQ ID NO: 35

GTAGATGCAG TTCTCCAGCC TTCATTACCT GGCGAATTCA GATACTACCC AAACATCATA GCAAAAGGGG TCGGGAAAAT CAGACAGTAA AATCAACAAC CCTGATATCC AACATTGCAA 4820 ATCAGGCTAC CCACAGGAGA AAAATCAAAA ACTTAGGATC AAAGGGATCA CCACGAACCC 4880 CGGAAAACAG CCAAACAAAC CAACACACAA ATCACAGACA AAAAGGAGAA GGCACTGCAA AGACCGAGAA AAAACAGAAC GCACACAACC AAGCAGAGAA AAGCCAAAGC CCGCCATTCA 5000 CAAACACC AACAATCCTG CAAACAAGCA CCAAAACAGA GGTCAAAAGA CAAAGAGCAC 5060 CAGATATGAC CATCACAACC ACAATCATAG CCATATTACT AATACCCCCA TCATTTTGTC 5120 AAATAGACAT AACAAAACTG CAACGTGTAG GTGTGTTAGT CAACAATCCT AAAGGCATGA 5180 AGATTTCACA AAATTTCGAA ACGAGATACC TGATATTAAG TTTGATACCC AAAATAGAGA 5240 ATTCACACTC ATGTGGGGAT CAACAGATAA ACCAATACAA GAAGTTATTG GATAGATTGA 5300 TAATTCCTCT ATATGATGGA TTAAAATTAC AAAAAGATGT AATAGTAGTA AGTCATGAAA 5360 CCCACAACAA TACTAATCTT AGGACAAAAC GATTCTTTGG AGAGATAATT GGGACAATTG 5420 CGATAGGGAT AGCCACTICA GCACAAATCA CCGCAGCAGT CGCTCTTGTC GAAGCTAAAC 5480 AGGCAAAGTC AGACATAGAA AAACTCAAAG AGGCTATAAG AGACACAAAC AAGGCAGTAC AATCGATTCA AAGTTCTGTA GGTAACCTAA TTGTTGCAGT TAAATCAGTT CAAGACTATG 5600 TCAACAATGA AATTATACCT TCAATCACAA GATTAGGCTG TGAAGCAGCA GGGTTACAAT 5660 TGGGAATTGC ATTGACACAA CATTACTCAG AATTAACAAA TATATTTGGT GATAATATAG 5720 GAACACTGAA AGAAAAAGGG ATAAAATTAC AAGGGATAGC ATCATTATAT CACACAAACA 5780 TAACGGAAAT ATTTACTACT TCAACAGTTG ACCAATATGA TATTTATGAC CTATTATTCA 5840 CTGAGTCAAT CAAGATGAGA GTGATAGATG TTGATTTGAG TGATTACTCA ATTACTCTTC AAGTTAGACT TCCTTTATTA ACTAAACTAT CAAATACTCA AATTTATAAA GTAGATTCTA TATCATACAA CATCCAGGGC AAAGAGTGGT ATATTCCTCT TCCCAATCAC ATCATGACAA 6020 AAGGGGCTTT TCTAGGTGGT GCTGATATTA AAGAATGCAT AGAGGCATTC AGCAGTTATA 6080 TATGTCCTTC TGATCCAGGT TACATATTAA ATCACGAGAT AGAGAATTGT TTATCAGGGA ACATAACACA GTGTCCTAAG ACTGTTGTTA CATCAGATGT GGTACCACGA TACGCGTTTG 6200 TGAATGGTGG ATTAATTGCA AACTGCATAA CAACTACATG TACATGCAAT GGAATTGACA 6260 ATAGAATTAA TCAATCACCT GATCAAGGAA TTAAGATCAT AACACATAAA GAATGCCAGG 6320 TAATAGGTAT AAACGGAATG TTATTCAATA CTAATAGAGA AGGGACATTA GCAACTTATA 6380 CATTTGATGA CATCATATTA AATAACTCTG TTGCACTTAA TCCAATTGAT ATATCTATGG 6440 6500 AAAAGTTAGA TTCCGTTGGA AGTTGGTATC AATCTAGTGC AACAATCACC ATAAT CATAG 6560 TGATGATAAT AATTCTAGTT ATAATCAATA TAACAATTAT TGTAGTCATA ATCAAATTCC 6620 ATAGAATTCA GGGGAAAGAT CAAAACGACA AAAACAGTGA GCCGTATATA CTGACAAATA 6680 GACAATAAGA CTATACACGA TCAAATATAA AAAGTACAAA AAACTTAGGA ACAAAGTTGT 6740 TCAACACAGC AGCACCGAAT AGACCAAAAG GCAGCGCAGA GGCGACACCA AACTCAAAAA 6800 TGGAATATTG GAAACACACA AACAGCATAA ATAACACCAA CAATGAAACC GAAACAGCCA 6860 GAGGCAAACA TAGTAGCAAG GTTACAAATA TCATAATGTA CACCTTCTGG ACAATAACAT 6920 TAACAATATT ATCAGTCATT TTTATAATGA TATTGACAAA CTTAATTCAA GAGAACAATC 6980 ATAATAAATT AATGTTGCAG GAAATAAGAA AAGAATTCGC GGCAATAGAC ACCAAGATTC 7040 7050 AGAGGACTTC

Inventor: Mario H. Skiadopoulos et al.

ATTENUATED HUMAN-BOVINE
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GGATGACATT	GGAACCTCAA	TACAGTCAGG	AATAAAT ACA	AGACTTCTCA	CAATT CAGAG	7110
TCATGTTCAA	AACTATATCC	CACTATCATT	AACACAA CAA	ATGTCAGATC	TCAGA AAATT	7170
TATCAATGAT	CTAACAAATA	AAAGAGAACA	TCAAGAA GTG	CCAATACAGA	GAATG ACTCA	7230
TGATAGAGGT	ATAGAACCCC	TAAATCCAAA	CAAGTT CTGG	AGGTGTACAT	CTGG TAACCC	7290
ATCTCTAACA	AGTAGTCCTA	AGATAAGGTT	AATACCA GGA	CCAGGTTTAT	TAGCA ACATC	7350
TACTACAGTA	AATGGCTGTA	TTAGAATTCC	ATCGTTAGTA	ATCAATCATC	TAATC TATGC	7410
TTACACCTCT	AATCTTATTA	CCCAGGGCTG	TCAAGAT ATA	GGGAAATCTT	ACCAA GTACT	7470
ACAAATAGGG	ATAATTACTA	TAAAT TCGGA	CCTAGTACCT	GAT TTAAACC	CCAGAGTCAC	7530
ACATACATTT	AATATTGATG	ATAATAGAAG	ATCTTGC TCT	CTGGCACTAT	TGAAT ACAGA	7590
TGTTTATCAG	TTATGCTCAA	CACCAAAAGT	TGATGAA AGA	TCCGATTATG	CATCA ACAGG	7650
TATTGAGGAT	ATTGTACTTG	ACATTGTCAC	TAATAAT GGA	TTAATTATAA	CAACAAGGTT	7710
TACAAATAAT	aatataact t	TTGATAAACC	GTATGCA GCA	TTGTATCCAT	CAGTG GGACC	7770
AGGAATCTAT	TATAAGGATA	AAGTTATATT	TCTCGGA TAT	GGAGGTCTAG	AGCAT GAAGA	7830
AAACGGAGAC	GTAATATGT A	ATACAACTGG	TTGTCCT GGC	AAAACACAGA	GAGAC TGTAA	7890
TCAGGCTTCT	TATAGCCCAT	GGTTCTCAAA	TA GGAGAATG	GTAAACTCTA	TTATTGTTGT	7950
TGATAAAGGC	ATAGATGCAA	CTTTTAGCTT	GAGGGTG TGG	ACTATTCCAA	TGAGC CAAAA	8010
TTATTGGGGA	TCAGAAGGAA	GATTACTTTT	ATTAGGT GAC	AGAATATACA	TATAT ACTAG	8070
ATCCACAAGT	TGGCACAGT A	AATTACAGTT	AGGGGTA ATT	GATATTTCTG	ATTATACTAA	8130
TATAAGAATA	AATTGGACT T	GGCATAATGT	ACTATCA CGG	CCAGGGAATG	ATGAA TGTCC	8190
ATGGGGTCAT	TCATGCCCAG	ACGGATGTAT	AACAGGA GTT	TACACTGATG	CATAT CCGCT	8250
AAACCCATCG	GGGAGTGTTG	TATCATCAGT	AATTCTT GAT	TCACAAAAGT	CTAGAGAAAA	8310
CCCAATCATT	ACTTACTCAA	CAGCTACAAA	TAGAATAAAT	GAATTAGCTA	TATATAAC AG	8370
AACACTTCCA	GCTGCATATA	CAACAACAAA	TTGTATC ACA	CATTATGATA	AAGGG TATTG	8430
TTTTCATATA	GTAGAAATAA	ATCACAGAAG	TTTGAAT ACG	TTTCAACCTA	TGTTA TTCAA	8490
AACAGAAGTT	CCAAAAAACT	GCAGCTAAAT	TGATCAT CGC	ATATCGGATG	CAAGA TGACA	8550
TTAAAAGAGA	CCACCAGACA	GACAACACAG	GAGACGA TGC	AAGATATAAA	GAAAT AATAA	8610
AAAACTTAGG	agaaaagtg t	GCAAGAAAAA	TGGACAC CGA	GTCCCACAGC	GGCAC AACAT	8670
CTGACATTCT	GTACCCTGAA	TGTCACCTCA	ATTCTCC TAT	AGTTAAAGGA	AAGAT AGCAC	8730
AACTGCATAC	AATAATGAG T	TTGCCTCAGC	CCTACGATAT	GGATGAT GAT	TCAATACTGA	8790
TTATTACTAG	ACAAAAAAT T	AAACTCAATA	AATTAGA TAA	AAGACAACGG	TCAAT TAGGA	8850
AATTAAGATC	AGTCTTAATG	GAAAGAGTAA	GTGATCT AGG	TAAATATACC	TTTAT CAGAT	8910
ATCCAGAGAT	GTCTAGTGAA	ATGTTCCAAT	TATGTAT ACC	CGGAATTAAT	AATAA AATAA	8970
ATGAATTGCT	AAGTAAAGCA	AGTAAAACAT	ATAATCA AAT	GACTGATGGA	TTAAG AGATC	9030
TATGGGTTAC	TATACTATCG	AAGTTAGCAT	CGAAAAA TGA	TGGAAGTAAT	TATGA TATCA	9090
ATGAAGATAT	TAGCAATATA	TCAAATGTTC	ACATGAC TTA	TCAATCAGAC	AAATGGTATA	9150
ATCCATTCAA	GACATGGTT T	ACTATTAAGT	ATGACA TGAG	AAGATTACAA	AAAG CCAAAA	9210
ATGAGATTAC	ATTCAATAGG	CATAAAGATT	ATAATCT ATT	AGAAGACCAA	AAGAA TATAT	9270
TGCTGATACA	TCCAGAACTC	GTCTTAATAT	TAGATAA ACA	AAATTACAAT	GGGTA TATAA	9330
TGACTCCTGA	ATTGGTACTA	ATGTATTGTG	atgtagt tga	AGGGAGGTGG	AATAT AAGTT	9390
CATGTGCAAA						9400

Doeket No.: NIII-0127
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CHIMERIC PARAINFLUENZA VIRUS (PIV)
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ATTGGATCCT	AAGTTACAA T	CAATGTATTA	TAAGGGT AAC	AATTTATGGG	AAATA ATAGA	9460
TGGACTATTC	TCGACCTTAG	GAGAAAGAAC	ATTTGAC ATA	ATATCACTAT	TAGAA CCACT	9520
TGCATTATCG	CTCATTCAAA	CTTATGACCC	GGTTAAA CAG	CTCAGGGGGG	CTTTT TTAAA	9580
TCACGTGTTA	TCAGAAATGG	AATTAATATT	TGCAG CTGAG	TGTACAACAG	AGG AAATACC	9640
TAATGTGGAT	TATATAGAT A	AAATTTTAGA	TGTGTTC AAA	GAATCAACAA	TAGAT GAAAT	9700
AGCAGAAATT	TTCTCTTTC T	TCCGAACTTT	TGGACAC CCT	CCATTAGAGG	CGAGT ATAGC	9760
AGCAGAGAAA	GTTAGAAAG T	ATATGTATAC	TGAGAAA TGC	TTGAAATTTG	ATACT ATCAA	9820
TAAATGTCAT	GCTATTTTTT	GTA CAATAAT	TATAAATGGA	T ATAGAGAAA	GACATGGTGG	9880
TCAATGGCCT	CCAGTTACAT	TACCTGTCCA	TGCACAT GAA	TTTATCATAA	ATGCA TACGG	9940
ATCAAATTCT	GCCATATCAT	ATGAGAATGC	TGTAGAT TAT	TATAAGAGCT	TCATA GGAAT	10000
AAAATTTGAC	AAGTTTATAG	AGCCTCAATT	GGATGAA GAC	TTAACTATTT	ATATGAAAG A	10060
TAAAGCATTA	TCCCCAAAGA	AATCAAACTG	GGACACA GTC	TATCCAGCTT	CAAACCTGTT	10120
ATACCGCACT	AATGTGTCT C	ATGATTCACG	AAGATTG GTT	GAAGTATTTA	TAGCA GATAG	10180
TAAATTTGAT	CCCCACCAAG	TATTAGATTA	CGTAGAA TCA	GGATATTGGC	TGGAT GATCC	10240
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TGCAAAAATG	ACATACAAGA	TGAGGGCTAC	ACAAGTA TTA	TCAGAAACAT	TATTG GCGAA	10360
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GAGACTAACA	ACAATATCT A	TGTCTGGAGT	TCCGCGG TAT	AATGAGGTAT	ACAATAATTC	10480
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AACCGTAAGC	TGCTTCTTAA	CGACAGATCT	TAAAAAA TAT	TGTTTAAATT	GGAGG TATGA	10660
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TTGGCTGCAC	CCTCGCCTTG	AAAAGAGTAC	AATATAT GTT	GGAGATCCTT	ATTGC CCGCC	10780
ATCAGATATT	GAACATTTAC	CACTTGATGA	CCATCCT GAT	TCAGGATTTT	ATGTT CATAA	10840
TCCTAAAGGA	GGAATAGAA G	GGTTTTGCCA	AAAGTTA TGG	ACACTCATAT	CTATCAGTGC	10900
AATACATTTA	GCAGCTGTCA	AAATCGGTGT	AAGAGTT ACT	GCAATGGTTC	AAGGG GATAA	10960
TCAAGCCATA	GCTGTTACCA	CAAGAGTACC	TAATAAT TAT	GATTATAAAG	TTAAG AAAGA	11020
GATTGTTTAT	AAAGATGTGG	TAAGATTTTT	TGATTCC TTG	AGAGAGGTGA	TGGAT GATCT	11080
GGGTCATGAG	CTCAAACTAA	ATGAAA CTAT	AATAAGTAGT	AAAA TGTTTA	TATATAGCAA	11140
AAGGATATAC	TATGACGGAA	GAATCCTTCC	TCAGGCA TTA	AAAGCATTGT	CTAGA TGTGT	11200
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GTTTGCAAAG	GCCATTGAG A	ATGGCTACTC	ACCTGTA TTG	GGATATGTAT	GCTCAATCTT	11320
CAAAAATATC	CAACAGTTGT	ATATAGCGCT	TGGAATG AAT	ATAAACCCAA	CTATA ACCCA	11380
AAATATTAAA	GATCAATAT T	TCAGGAATAT	TCATTGGATG	CAATATGCCT	CCTTAATCCC	11440
TGCTAGTGTC	GGAGGATTTA	ATTATATGGC	CATGTCAAGG	TGTTTTGTCA	GAAAC ATTGG	11500
AGATCCTACA	GTCGCTGCGT	TAGCCGA TAT	TAAAAGATTT	ATAAA AGCAA	ATTTGTTAGA	11560
TCGAGGTGTC	CTTTACAGAA	TTATGAATCA	AGAACCA GGC	GAGTCTTCTT	TTTTA GACTG	11620
GGCCTCAGAT	CCCTATTCAT	GTAACTTACC	ACAATCT CAA	AATATAACCA	CCATGATAAA	11680
GAATATAACT	GCAAGAAATG	TACTACAGGA	CTCACCA AAC	CCATTACTAT	CTGGATTATT	11740
TACAAGTACA						11750

Docket No.. NIH-0127
Inventor: Mario H. Skiadopoulos et al.

Title: ATTENUATED HUMAN-BOVINE
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ATGATAGAAG	AGGATGAGGA	ATTAGCTGAG	TTCCTAA TGG	ACAGGAGAAT	AATCC TCCCA	11810
AGAGTTGCAC	ATGACATTT T	AGATAATTCT	CTTACTGGAA	TTAGGAATGC	TATAG CTGGT	11870
ATGTTGGATA	CAACAAAATC	ACTAATTCGA	gtaggga taa	GCAGAGGAGG	ATTAACCTAT	11930
AACTTATTAA	GAAAGATAAG	CAACTATGAT	CTTG TACAAT	ATGAGACACT	TA GTAAAACT	11990
TTAAGACTAA	TAGTCAGTGA	CAAGATTAAG	TATGAAG ATA	TGTGCTCAGT	AGACC TAGCC	12050
ATATCATTAA	GACAAAAA T	GTGGATGCAT	TTATCAGGAG	GAAGAATGAT	AAATGGACTT	12110
GAAACTCCAG	ATCCTTTAGA	GTTACTGTCT	ggagtaa taa	TAACAGGATC	TGAAC ATTGT	12170
AGGATATGTT	ATTCAACTGA	AGGTGAAAGC	CCATATACAT	GGATGTATTT	ACCAGG CAAT	12230
CTTAATATAG	GATCAGCTGA	GACAGGAATA	GCATCAT TAA	GGGTCCCTTA	CTTTGGATCA	12290
GTTACAGATG	AGAGATCTG A	AGCACAATTA	GGGTATA TCA	AAAATCTAAG	CAAACCAGCT	12350
AAGGCTGCTA	TAAGAATAGC	AATGATATAT	ACTTG GGCAT	TTGGGAATGA	CGAAATATCT	12410
TGGATGGAAG	CATCACAGA T	TGCACAAACA	CGTGCAA ACT	TTACATTGGA	TAGCT TAAAG	12470
ATTTTGACAC	CAGTGACAAC	ATCAACAAAT	CTATCAC ACA	GGTTAAAAGA	TACTGCTACT	12530
CAGATGAAAT	TTTCTAGTAC	ATCACTTATT	AGAGTAA GCA	GGTTCATCAC	AATAT CTAAT	12590
GATAATATGT	CTATTAAAGA	AGCAAATGAA	ACTAAAGAT A	CAAATCTTAT	TTATCAA CAG	12650
GTAATGTTAA	CAGGATTAAG	TGTATTTGAÅ	TATCTAT TTA	GGTTAGAGGA	GAGTA CAGGA	12710
CATAACCCTA	TGGTCATGC A	TCTACATATA	GAGGATG GAT	GTTGTATAAA	AGAGA GTTAC	12770
AATGATGAGC	ATATCAATCC	GGAGTCTACA	TTAGAG TTAA	TCAAATACCC	TGAG AGTAAT	12830
GAATTTATAT	ATGATAAGGA	CCCTTTAAAG	GATATAG ATC	TATCAAAATT	aatgg ttata	12890
AGAGATCATT	CTTATACAAT	TGACATGAAT	TACTGGG ATG	ACACAGATAT	TGTACATGCA	12950
ATATCAATAT	GTACTGCAG T	TACAATAGCA	GATACAA TGT	CGCAGCTAGA	TCGGG ATAAT	13010
CTTAAGGAGC	TGGTTGTGAT	TGCAAATGAT	GATGATATT A	ACAGTCTGAT	AACTGAA TTT	13070
CTGACCCTAG	ATATACTAG T	GTTTCTCAAA	ACATTTGGAG	GGTTACTCGT	GAATC AATTT	13130
GCATATACCC	TTTATGGAT T	GAAAATAGAA	GGAAGGG ATC	CCATTTGGGA	TTATA TAATG	13190
AGAACATTAA	AAGACACCTC	ACATTCAGTA	CTTAAA GTAT	TATCTAATGC	ACTA TCTCAT	13250
CCAAAAGTGT	TTAAGAGAT T	TTGGGATTGT	GGAGTTT TGA	ATCCTATTTA	TGGTC CTAAT	13310
ACTGCTAGTC	AAGATCAAG T	TAAGCTTGCT	CTCTCGATTT	GCGAGTACTC	CTTGGATCTA	13370
TTTATGAGAG	AATGGTTGAA	TGGAGCATCA	CTTGAGA TCT	ATATCTGTGA	TAGTG ACATG	13430
GAAATAGCAA	ATGACAGAAG	A CAAGCATTT	CTCTCAAGAC	ATCTTGCCTT	tgtgtgtt gt	13490
TTAGCAGAGA	TAGCATCTTT	TGGACCAAAT	TTATTAA ATC	TAACATATCT	AGAGA GACTT	13550
GATGAATTAA	AACAATACTT	AGATCTGAAC	ATCAAAG AAG	ATCCTACTCT	TAAAT ATGTG	13610
CAAGTATCAG	GACTGTTAAT	TAAATCATTC	CCCTCAACTG	TTACGTATGT	AAGGA AAACT	13670
GCGATTAAGT	atctgagga t	TCGTGGTATT	AATCCGC CTG	AAACGATTGA	AGATT GGGAT	13730
CCCATAGAAG	ATGAGAATA T	CTTAGACAAT	attgtta aaa	CTGTAAATGA	CAATT GCAGT	13790
GATAATCAAA	AGAGAAATAA	AAGTAGTTAT	TTCTGGG GAT	TAGCTCTAAA	GAATT ATCAA	13850
GTCGTGAAAA	TAAGATCCAT	AACGAGTGAT	TCTGAAGTTA	ATGAAGCTTC	GAATGTTAC T	13910
ACACATGGAA	TGACACTTCC	TCAGGGAGGA	AGTTATC TAT	CACATCAGCT	GAGGT TATTT	13970
GGAGTAAACA	GTACAAGTTG	TCTTAAAGCT	CTTGAAT TAT	CACAAATCTT	AATGA GGGAA	14030
GTTAAAAAAG	ATAAAGATAG	ACTCTTTTA	GGAGAAG GAG	CAGGAGCTAT	GTTAGCATGT	14090
TATGATGCTA	•					14100

Docket No.: NTH-0127
Inventor: Mario H. Skiadopoulos et al.

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SEQ ID NO: 35

CACTCGGTCC TGCAATAAAT TATTATAATT CTGGTTTAAA TATTACAGAT GTAATTGGTC 14160 AACGGGAATT AAAAATCTTC CCATCAGAAG TATCATTAGT AGGTAAAAAA CTAGGAAATG 14220 TAACACAGAT TCTTAATCGG GTGAGGGTGT TATTTAATGG GAATCCCAAT TCAACATGGA 14280 TAGGAAATAT GGAATGTGAG AGTTTAATAT GGAGTGAATT AAATGATAAG TCAATTGGTT 14340 TAGTACATTG TGACATGGAG GGAGCGATAG GCAAATCAGA AGAAACTGTT CTACATGAAC 14400 ATTATAGTAT TATTAGGATT ACATATTTAA TCGGGGATGA TGATGTTGTC CTAGTATCAA 14460 AAATTATACC AACTATTACT CCGAATTGGT CTAAAATACT CTATCTATAC AAGTTGTATT 14520 GGAAGGATGT AAGTGTAGTG TCCCTTAAAA CATCCAATCC TGCCTCAACA GAGCTTTATT 14580 TAATTTCAAA AGATGCTTAC TGTACTGTAA TGGAACCCAG TAATCTTGTT TTATCAAAAC 14640 TTAAAAGGAT ATCATCAATA GAAGAAAATA ATCTATTAAA GTGGATAATC TTATCAAAAA 14700 GGAAGAATAA CGAGTGGTTA CAGCATGAAA TCAAAGAAGG AGAAAGGGAT TATGGGATAA 14760 TGAGGCCATA TCATACAGCA CTGCAAATTT TTGGATTCCA AATTAACTTA AATCACTTAG 14820 CTAGAGAATT TTTATCAACT CCTGATTTAA CCAACATTAA TAATAATT CAAAGTTTTA 14880 CAAGAACAAT TAAAGATGTT ATGTTCGAAT GGGTCAATAT CACTCATGAC AATAAAAGAC 14940 ATAAATTAGG AGGAAGATAT AATCTATTCC CGCTTAAAAA TAAGGGGAAA TTAAGATTAT 15000 TATCACGAAG ATTAGTACTA AGCTGGATAT CATTATCCTT ATCAACCAGA TTACTGACGG 15060 GCCGTTTTCC AGATGAAAAA TTTGAAAATA GGGCACAGAC CGGATATGTA TCATTGGCTG 15120 ATATTGATTT AGAATCCTTA AAGTTATTAT CAAGAAATAT TGTCAAAAAAT TACAAAGAAC 15180 ACATAGGATT AATATCATAC TGGTTTTTGA CCAAAGAGGT CAAAATACTA ATGAAGCTTA 15240 TAGGAGGAGT CAAACTACTA GGAATTCCTA AACAGTACAA AGAGTTAGAG GATCGATCAT 15300 CTCAGGGTTA TGAATATGAT AATGAATTTG ATATTGATTA ATACATAAAA ACATAAAATA 15360 AAACACCTAT TCCTCACCCA TTCACTTCCA ACAAAATGAA AAGTAAGAAA AACATGTAAT 15420 15456 ATATATAC CAAACAGAGT TTTTCTCTTG TTTGGT

FIGURE 1G

Dockei No.: NIH-0127
Inventor: Mario H. Skiadopoulos et al.
Title: ATTENUATED HUMAN-BOVINE
CHIMERIC PARAINFLUENZA VIRUS (PIV)
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Serial No.: 09/900,112 Filing Date: July 5, 2001

TARAGRACTT TACCGARAGG TARGGGGANA GANATCCTAA GARCTGARAC ATGTTGAGCC 180 TATTCCCGG GCARAGANAC GARACATAC GARACCATCA ATAACGATG 240 ACAATGATAA AATGACATCA GCTCTTCTCT TTTTTGCTCT TTCTTTGACCA ATAACAGATG 240 AGAATGATAA AATGACATG GCTCTTCTCT TTTTTGCTCT TTCTTTGAC ATAACAAGT 360 AGAAGACCC AGGAAGACG AATATGGTT CTCTGTTATA ATAGGTTATA CACACCCAG 360 AGAAAGACC AGGAAGACG AAATATGGT GGTTGTCGT CAAGACTAGA GGTTGGTACG AGGAATGGTT 480 AGAAAAGAC CACACTATAC AGGAATTGTT GGTTAGATTCA GGTTAGATTCA GGTTAGATTCA GGTTAGATTCA ATCCAAGTTCA AGGATTCTTCT GATAACCATATACA ATCCAAGTTA AGGATTCATCT GGTTAGATCA ATTAACCATT 600 CCCAACAGAG CTTGGTTAC ATCTGTTACTC GGTTAGATCA ACAATTACAA AGAATTACAA AAATTACAAC ATTATCACAT AGGATTCAACA AGAATTACAACA ATTATCACAT AGGATTACAA AGAATTA	ACCAAACAAG	AGAAGAGAC T	TGCTTGGGAA	TATTAAT TCA	AATAAAATT	AACTT AGGAT	60
TRATECCOG GCANANANAC ACTGTGTCTA TATTTGCTCT TGGACCATCA ATANCAGATG 240 ACAATGATAA ANTGACATTG GCTCTTCTCT TTTTGTCTCA TTCTTTAGAC ANTGANANGC 300 AGCATGGGA ANTATATTT CTCTGTTATC ANTGATATTT CCCAACCCAG 360 AATTATATTT AACACCAAG ATTGATAGATG CAGATGTTAA ATATGATAGA GAGATGTTA 420 AGAAAGACC AGGAAGTGGA AATTATGTGGGGA GTGTTTTAA GAGATATTGA GAGATATGT 480 TGCAAAATGG AACTGATTGA GAGATATTTT CAGAATATGT 600	TAAAGAACTT	TACCGAAAGG	TAAGGGGAAA	GAAATCC TAA	GACTGTAATC	ATGTT GAGTC	120
ACAATGATAA ANTGACATTG GCTCTTCTCT TTTTGTCTCA TTCTTTAGAC AATGAAAAGC 300 AGCATGCGCA AAGAGCTGGA TTTTTAGTTT CTCTGTTATC AATGGCTTAT GCCAACCCAG 360 AATTATATTT AACATCAAAT GGTAGTAATG CAGATGTTAA ATATGTTATC TACATGATAG 420 AGAAAGACCC AGGAAGACAG AAATATGGTG GGTTTGTCGT CAAGACTAGA GAGATGATTT 480 ATGAAAAGAC AACTGATTGG ATGTCGGGA GTGATCTTG TCATACTTTT GATATCATT 540 TGCAAAAAGAC AACTGATTGG ATGTCGGGA GTGATCTTGT TCATACTTTT GAATATCAT 540 TGCAAAAAGAC TACAAAGACAT TCTACAATCG AGGATATATCT TCATACTTTT GAATATCAA GACAATATGT 540 TGCGAAAATGG TAGAAGCACT TCTACAATCG AGGATATATCT TGTAAAGCCT ATAACCAGTA 660 TATCAGGATT GAGGAAAAGGA TTCTTTACTC GGTTACAACC ATTTCGACACA GACAATATGT 720 TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGACA ATTATGAGGT 720 TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT 720 TTAAATCCAG TCTAGACCA CTCATGGTTG AACACTGAT AACAATGAAC ACAGGCAGGA 840 ATGATCTGAC AACAATAGAA AAGAATATAC AGATTGAACA AACAATGAAC ACAGGCAGGA 840 ATGATCTGAC CCTTAGACCG GATACCAACA ACACTGAT AACAATGAAC ACAGGCAGGA 840 ATGATCTGCTC ATTTTTCAAC ACAATCAGAT ATGGCATTCA GACTAGAATG CAGGCTCTTAA 960 CTCTGTCTCTC CCTTAGACCG GATACCAACA ACCTCAAGGC ACTGATCGAG TTATATCTAT 1020 CACAGGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGT TGTACAAACA 1140 AGGCCATCACA ACAGTATGTA ACAGGAGGT CTTTTATATGCA TTTTGTGAGA TCTTGTGACAGT TGTACAAACA 1140 AGGCCATCACA AGAAGCCTGA CAAGCCTGA ACAGGATCG TGTACCAATG TTCCAACTTG 1200 GTCAAGCAG GCACCTGAT CCCGGAGTCGC AGATGACTC AATATTAAGAG GATGAACTG 1220 GTCAAGCAT TCATAAGCCT ACAGGGGGAT CAACCGGA ATGAACACA ATTGGAATG TTCCAACTTG 1220 GTCAAGCAG CTAATCCAG GAGAACCAGG ACACACGAGA ATGAGACAC ACAGAAACACA ATGAACACA ACAGAAACACA ATGAACACA AACAGAAAA ACAACACAA AACACACAA AACACACAAA AACACACAAA AACACACAAA AACAAC	TATTCGACAC	ATTCAGTGCG	CGTAGGCAGG	AGAACAT AAC	GAAATCAGCT	GGTGG GGCTG	180
AGCATGOGCA AAGAGCTGGA TITTIAGTIT CTCTGTTATC AATGGCTTAT GCCAACCCAG AATTATATTT AACATCAAAT GGTAGTAATG CAGATGTTAA ATATGTTATC TACATGATAG AGAAAGACCC AGGAAGACAG AAATATGGTG GGTTTGTCGT CAAGACTAGA GAGATGGTTT AGAAAAGACC AGGAAGACAG AAATATGGTG GGTTTGTCGT CAAGACTAGA GAGATATGT TGCAAAAAGAC AACGATTGG ATGTTCGGGA GTGATCTTGA GTATGATCAA GACAATATGT TGCAAAAAGAC AACGATTGG ATGTTCGGGA GTGATCTTGA GTATCATTT GGATATCCAT GGGTCTTTGG AGGCACTTATA ATCCAAGTTT GGATAATCT TGTTAAGCT ATAACCAGTA 660 CGTGTCTTGG AGGCACTTATA ATCCAAGTTT GGATAACT TGTTAAGCT ATAACCAGTA 660 TTAAATCCAG TCTAGGTTG AGCGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT TTAAATCCAG TCTAGGTTG AGCGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT TTAAATCCAG TCTGGTAACA CTCATGGTTG AAACACTGAT AACAATGAAC ACAGGCAGGA ATGATCTGAC CATTGGACA CTCATGGTTG AAACACTGAT AACAATGAAC ACAGGCAGGA ATGATCTGAC CATTGGACC GATATCAACA GACTCAAGGC AACTGAACAC ACAGGCAGGA ATGATCTGAC CATTGGACC GATATCAACA GACTCAAGGC ACTGATCGAG TTATATCTAT 1020 CACAAGGGCA CTATCCTGCC TTTATATGCA TTTTTAATGC TTTTTATATGA TCCATTGAGAC ACAGGCACAGGAA CTGATCCAGC CTCTGGAGTT TATGGAGT TTTTTATATCA TTTTTAAGAC ACAGTAGAACA ATTGGAATG TTCCAACACTG GTGAGTTTG 1080 AGGCCATACAA AGAAGCACAG CAAAGCTTGA AGAACACAT GAAGAACACA TTCCAACACTG GTCAACTTG 1200 GTCAAGCAGT GGCACTGTAT ACAGGAAGGT CTTTACTGGA TATTGTAAATG TTCCAACTTG 1200 GTCAAGCACT GCACCTGAT CCCGGGCTCCC AGATGGATC AATATTAAAGC TTCCAACACG GCACACGACACAC AGAAGCCAAG CAAAGCTTGA ACAGGAACAC AAAGCCAACAC AGAAGCCAAG AGAACCGGA ACAGGATCAG ACAGGATCAG ACAGGATCAG ACAGGATCAC ACAGGACAC AGAACCGGA ACAGGATCAC ACAGGACACAC AGAACCGGA ACAGGATCAC ACAGGACAC ACAACCCGAA ACACCAGAAA ACACCACAA AACACCAA AACACCAA AACACCAAAACACA AACACCAA AACACCAA AACACCAAAACCAA AACACCAAAAACCAA AACACCAAAACCAA AACACCAAAACAA AACACCAAAACAA AACACCAAAACAA AACACCAAAACAA AACACCAAAACAA AACACCAAAACAA AACACCAAAACAA AACACCAAAAACAAACAAACAAACAAAACAAAACAAACAAAA	TTATTCCCGG	GCAAAAAAAC	ACTGTGTCTA	TATTTGCTCT	TGGACCATCA	ATAACAGATG	240
ANTITATITI AACATCAAAT GGTAGTAATG CAGATGTTAA ATATGTTATC TACATGATAG AGAAAGACC AGGAAGACAG AAATATGGTG GGTTTGTCGT CAAGACTAGA GAGATAGGTT ATGAAAAGAC AACTGATTGG ATGTTCGGGA GTGATCTTGA GTATGATCAA GACAATATGT TGCAAAATGG TAGAAGCACT TCTACAATCG AGGATCTTGT TCATACTTTT GGATATCCAT GGCAAAATGG TAGAAGCACT TCTACAATCG AGGATCTTGT TCATACTTTT GGATATCCAT CCTGTCTTGG AGCCCTTATA ATCCAAGTTT GGATAATACT TGTTAAGCCT ATAACCAGTA TATCAGGATT GAGAAAAGGA TTCTTTACTC GGTTAGAAGC ATTTCGACAA GATGGAACAG TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT TATAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT TATAAATCCAG TCTAGTACAA CTCATGGTTG AAACACTGAT AACAATGAAC ACAGCAGGA ATGATCTGAC AACAATAGAA AAGAATAAC AGATCTACAT CAGAGATGCAG ATGATCTGAC AACAATAGAA AAGAATAAC AGATCTACAT CAGAGATGCAG GTCTTGCTTC ATTTTTCAAC ACAATCAGAT ATGCGATTGA GACTAGAAC ACAGCATGCAG GTCTTGCTTC ATTTTTCAAC ACAATCAGAT ATGCGATTGA GACTAGAATG GCAGCTCTAA GGCCATGCAA CCTAGCCCG GATATCAACA GACTCAAGGC ACTGATCAGG TTATATCTAT 1020 CACAGGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGTT GTACAAAACA 1140 AGGCCATGCAA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAACT TCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCCAGTCGC AGATGGATC AATATTAGAG GATGAACTCA CAGCATTGA ACAGCTTGA ACAGCTTGA ACAGCATTGA ACAGCTTGA ACAGCCTTGA CAAACCTT TCATAAGCCT ACAGCGTGGA CAAACCTTGA ACAGCTTGA ACAGCTTGA ACAGCTTGA ACAGCTTGA ACAGCTTGA ACAGCTTGA ACAGCTTGA ACAGCTTACA ACAGCTTACA ACAGCTTACA ACAGCTTACA ACAGCTTACA ACAGCTTACA ACAGCTTACA ACAGCACTACA ACACCACAGA A	ACAATGATAA	AATGACATTG	GCTCTTCTCT	TTTTGTC TCA	TTCTTTAGAC	AATGA AAAGC	300
AGRAAGACCC AGGAAGACAG AAATATGGTG GGTTTGTCGT CAAGACTAGA GAGAT GGTTT ATGAAAAGAC AACTGATTGG ATGTTCGGGA GTGATCTTGA GTATGATCAA GACAA TATGT TGCAAAATGG TAGAAGCACT TCTACAATCG AGGATCTTGT TCATACTTTT GGATATCCAT GGTGTCTTGG AGCCCTTATA ATCCAAGTTT GGATAATACT TGTTAAGGCT ATAACCAGTA 660 CGTGTCTTGG AGCCCTTATA ATCCAAGTTT GGATAATACT TGTTAAGGCT ATAACCAGTA 660 TATCAGGATT GAGGAAAGGA TTCTTTACTC GGTTAGAAGC ATTTCGACAA GATGAACAG 720 TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATATGAGGT 780 CCCAACAGAG CTTGGTAACA CTCATGGTTG AAACACTGAT AACAATGAAC ACAGGCAGGA 840 GTCTTGCTTC ATTTTCAAC ACAATCAGAT ATGGCATTCA GACATCAGATC GAGAGATGCAG 900 GTCTTGCTTCA CCTTAGACCG GATACACAC AGATTGTAGG AAACTACATC AGAGATGCAG 900 GTCTTGCTTCA CCTTAGACCG GATACAACA GACTCAAGGC ACTGATCGAG TTATATCTAT 1020 CAAAAGGGGCC ACGTGCTCCT TTTATATGCA TTTTGAAGGA TCCCGTGCAT GGTGAGTTG GCACTCAAA 960 CCCAAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTACGAGT TTATATCTAT 1020 CACCAGGCAA CAAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGG GACCGTGAT GCCGAGTCCC AGATGGTTC ATATTGAAATG TTCCAACTTG 1200 GTCAAGCAGG ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAAG AGAAGCCAAG CAAAGCTTGA AGAAACAAC AAACAACAC AGCAGTTCAG 1260 GGTCAACACA AGAAGCCAAG CAAAGCTTGA AGAAACAAC GAAGAACAC AGCAGTTCAG 1260 GGGTCACACA AGAAGCCAAG CAAAGCTTGA AGAAACAAC GAAGAACAC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGGGATCAG ATAAGCAACAC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGGGAACAAG AAACAACAC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGGGAACAAA AACAACAC AACAACAC AACAACAC AACAAC	AGCATGCGCA	AAGAGCTGGA	TTTTTAGTTT	CTCTGTTATC	AATGGCTTAT	GCCAA CCCAG	360
ATGANANGAC AACTGATTGG ATGTTCGGGA GTGATCTTGA GTATCATCA GACAA TATGT TGCAAAATGG TAGAAGCACT TCTACAATCG AGGATCTTGT TCATACTTTT GGATATCCAT GCGTGTCTTGG AGCCCTTATA ATCCAAGTTT GGATAATACT TGTTAAGGCT ATAACCAGTA 660 TATCAGGATT GAGGAAAGGA TTCTTTACTC GGTTAGAAGC ATTTCGACAA GATGGAACAG 720 TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT 780 CCCAACAGAG CTTGGTAACA CTCATGGTTG AACACTGAT AACAATGAAC ACAGGCAGGA 840 ATGATCTGAC AACAATAGAA AAGAATATAC AGATTGTAGG AAACTACAC AGAGATCCAG 900 GTCTTGCTTC ATTTTTCAAC ACAATCAGAT ATGGCATTGA GACTAGAATG GAGGATCCAG 900 GTCTTGCTTC ATTTTTCAAC ACAATCAGAT ATGGCATTGA GACTAGAATG GAGGATCCAG 900 CCCAACAGGGCA CGTGCTCCT TTTATATGCA TTTTGAAGGG ACTGAACGG CAGGATTGAA GACGAGCACA CAGGCCAACGGA TTTATATCTAT 1020 CACAAGGGCA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGGT TGTATATCTAT 1020 CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGGT GTACAAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTTGAAAGT TCCAACTTG 1200 GTCAAGCAGG GCACGTGAT GCCGAGTCCC AGATGAGATC AATATTAGAG GATCAAAACAC 1200 GGGCCACACA AGAAGCCAAG CAAAGCTTGA AGAACACAT GAAGAACATC AGCAGTTCAG 1220 GGGTCAACAA AGAAGCCAAG CAAAGCTTGA AGAACACAT GAAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCATAG AATGCAACAA AGAACCAG GAAACCTGA CAGAGCAGAG	AATTATATTT	AACATCAAAT	GGTAGTAATG	CAGATGT TAA	ATATGTTATC	TACAT GATAG	420
TGCARAARGG TAGAAGCACT TCTACAATCG AGGATCTTOT TCATACTTTT GGATATCCAT CGTGTCTTGG AGCCCTTATA ATCCAAGTTT GGATAAACT TGTTAAGCCT ATAACCAGTA ATCCAGGATT GAGGAAAGGA TTCTTTACTC GGTTAGAACC ATTTCGACAA GATGGAACAG TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT TAGAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT ATGATCTGAC AACAATAGAA AAGAATATAC AGATTGAAGA AACAATGAAC ACAGGCAGGA ATGATCTGCT ATTTTTCAAC ACAATCAGAT ATGGCATTAG GAACTACATC AGAGATGCAG GTCTTGCTTC ACTTTAGACCG GATATCAACA GACTCAAAGGC ACTGAATCGA GCACCTCTAA 960 CTCTGTCTAC CCTTAGACCG GATATCAACA GACTCAAAGGC ACTGATCGAG TTATATCTAT 1020 CACAAGGGCAC CAGTGCTCCT TTTATATGCA TTTTGAGAGG TCCCGTGCAT GGTGAGTTTG 1080 CACCAGGCAA CAGTATCTAC CCTTGGAGTT ATGCGATTGG TGTAGCAGT TATATCTAT 1020 GTCAAGCAGTGA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGTGA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATCACAAACA 1140 AGGCCATCACAA AGAACCAAG CAAAGCTTGA AGAGAACATC AACAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAACTAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAACTAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGA TCAACGGGA TGAGCCTCGG TCATCCATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAACAC AACAGACA ACTACAAGAA 1500 TTGACAGCAT CAAAACTGAA CAAAGCAGAA ATGACAACAC AACAGACA ACTACAAGAA 1500 AGAAAAAGAAA ACAGGAGTGAC CAGACCAAA CAGAACACAC AACAGACA AACAACAC AACAACAC AAAACAACAC AAAACAAC	AGAAAGACCC	AGGAAGACAG	AAATATGGTG	GGTTTGT CGT	CAAGACTAGA	GAGAT GGTTT	480
CGTGTCTTGG AGCCCTTATA ATCCAAGTTT GGATAATACT TGTTAAGCCA ATAACCAGTA 660 TATACAGGATT GAGGAAAGGA TTCTTTACTC GGTTAGAACA ATTTCGACAA GATGGAACAG 720 TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTATGAGCA ATTAT GAGGT 780 CCCAACAGAG CTTGGTAACA CTCATGGTTG AACACTGAT AACACTGAC AGAGTGCAG 900 GTCTTGCTC ATTTTCACA CACATCAGAT ATGGCATTGA GACTCAAGGC GACTGCAGCAG 960 CTCTGTCTAC CCTTAGACCG GATATCAACA GACTCAAGGC ACTGATCGAG TTATATCTAT 1020 CACAGGCAA CATGCTGCC CTCTGGAGTT ATTTGAGAGC ACTGATCAAG ACTGAACAGC ACTGACAGT GGGGACAGCAGC CTCTTGGAGTT ACTGCAAGAGA TTATATCTAC 1080 GCCAAGGCAA CACAGTAGTA ACAGGAAGGT CTCTTGGAGTT ATTTGCAACTT TTCAAAACCA 1140 AGCCATGCAA ACAAGCAAGA CAAAGCCAAG CAAAGCCAAG CAAAGCCAAG AAAACAACAA CAACAGCAAGA CAAAGAACAA	ATGAAAAGAC	AACTGATTGG	ATGTTCGGGA	GTGATCT TGA	GTATGATCAA	GACAA TATGT	540
TATCAGGATT GAGGAAAGGA TTCTTTACTC GGTTAGAACA ATTTCGACAA GATGGAACAG 720 TTAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTATGAGGT 780 CCCAACAGAG CTTGGTTACA CTCATGGTTG AACACTGAT AACAATCACA ACAGGCAGGA 840 ATGATCTGAC AACAATCAGAT AACATCAGAT AACACTGAT AGAATCACAC GAGTGCACAC AGAGTGCAGC 900 GTCTGCTCT CTTTAGACCG GATATCAACA GACTCAAGGC ACTGATCAGG TTATATCTAT 1020 CACAGGCAA CCTTAGACCG GATATCAACA GACTCAAGGA ACTGATCAGG TTATATCTAT 1020 CACAGGCAA CACGTGCCT TTTATATCTAC TTTGAGAGG ACTGATCAGA GAGGCATGCA ACAGTATGTA ACAGGAAGGT TTTTGAGAGG TTCAAAACCT GACACATGAT ACAGGAAGGT CACAGGAACACA ACAAGCAAG CAAAACCTACA ACAAGACAACA CAAAACCAACA ACAAGAACACA CAAAACCAACA ACAAGAACAACA ACAACAACAA ACAACAACAA ACAACAACAA ACAACAACAA ACAACAACAA ACAACAACAA ACAACAACAA ACAACAACAA <td>TGCAAAATGG</td> <td>TAGAAGCACT</td> <td>TCTACAATCG</td> <td>AGGATCT TGT</td> <td>TCATACTTTT</td> <td>GGATA TCCAT</td> <td>600</td>	TGCAAAATGG	TAGAAGCACT	TCTACAATCG	AGGATCT TGT	TCATACTTTT	GGATA TCCAT	600
TRAAATCCAG TCTAGTGTTG AGCGGTGATG CAGTAGAACA AATTGGATCA ATTATGAGGT 780 CCCAACAGAG CTTGGTAACA CTCATGGTTG AAACACTGAT AACAATGAAC ACAGGCAGGA 840 ATGATCTGAC AACAATAGAA AAGAATATAC AGATTATAG AAACTTCATC AGAGATGCAG 900 GTCTTGCTTC ATTTTCAAC ACAATCAGAT ATGGCATTGA GACTAGAATG GCAGCTCTAA 960 CTCTGTCTAC CCTTAGACCG GATATCAACA GACTCAAGGC ACTGATCGAG TTATATCTAT 1020 CAAAGGGGCC ACGTGCTCCT TTTATATGCA TTTTGAGAGA TCCCGTGCAT GGTGAGTTTG 1080 CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATTGG TGTACAGTT GTACAAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAACATG TCCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTGG 1260 GGGTCAACACA AGAAGCCAAG CAAAGCTTGA AGAACACAT GAAGAACACT AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGCGGATA GATGAAGAAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATCCATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGCTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CAGAGATCAA CTGACATCA AACTGAATCA ACTACAGAAA 1500 ATGACAACTA TTTGTTCAGT GCATTCGGAA GCAACTCAC AAACAACAC AATCAAACTG 1620 AAAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACAC AATCAAACTG 1620 AAAAATCAA ATCATGAAA ACTTGGAAT AATGGAAATTA ACCGAACAC AATCAAACTG 1620 AAAAATCAA ATCATAGAAA ACTTGGAAT AATGGAAATT ATCCAATCCA	CGTGTCTTGG	AGCCCTTAT A	ATCCAAGTTT	GGATAATACT	tgtt aaggct	ATAACCAGTA	660
CCCAACAGAG CTTGGTAACA CTCATGGTTG AAACACTGAT AACAATGAAC ACAGGCAGGA ATGATCTGAC AACAATAGAA AAGAATATAC AGATTGTAGG AAACTACATC AGAGATGCAG 900 GTCTTGCTTC ATTTTTCAAC ACAATCAGAT ATGGCATTGA GACTAGAATG GCAGCTCTAA 960 CTCTGTCTAC CCTTAGACCG GATATCAACA GACTCAAGGC ACTGATCGG TTATATCTAT 1020 CAAAGGGGCC ACGTGCTCCT TTTATATGCA TTTTGAGAGG TCCCGTGCAT GGTGAGTTTG 1080 CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGACGT GTACAAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGA ACAGTATGTA ACAGGAAGGT CTTATCTGA TATTGAAATG TTCCAACTTG 1200 GGGCAACA AGAAGCCAAG CAAAGCTTGA AGAAACAAT GAAGAACAT AGAGAACATC AGCAGTTCAG 1320 ATACAACCT TCATAAGCCT ACAGGGGGGAT CAAGCCTAGA AGAAACAAT GAAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAAGCCTAGA ATGAACCAT AGAAACAAC ATGAACCAT TCATAAGCCT ACAGGGGGAT CAAGCCTAGA ATGACACAT ACAGGAACATC AGCAGTTCAG 1320 ATGCAGCACC TGAATCCAAG GAAACCAGG ATCAAGGGAA TGAGCCTCGG TCATCCATAGA 1380 ATGCAGACAC AAACCAGAA ACAGGAGAA ACAGGGGAA ACAGGGGAA ACAGGGGAA ATGACAACAA AACTGAAACA ACTGAAACACA AACTGAACAC AAACAGAAA 1500 ATGAAACAGA ACAGAGAGAA ACAGAGAGAA ACAGAGAAAA ACAGAGAAAA ACAGAGAAAA ACAGAGAAAA ACAGAGAGAA ACAGAGAGAA ACAGAGAGAA ACAGAGAAAA ACATCGAAAACAA ACTAGAAACAA AACTGAAACAA AACAACACA AATCAAACCG AAACACAAA ACACACAAAACACA AATCAAACCG AAACACACA AATCAAACCG AAACACAAA ACACACAAAAACAAA ACTAGAAACAAAAAACAAAAACAAAAACAAAAAAAAAA	TATCAGGATT	GAGGAAAGGA	TTCTTTACTC	GGTTAGAAGC	ATTTCGACAA	GATGG AACAG	720
ATGATCTGAC AACAATAGAA AAGAATATAC AGATTGTAGG AAACTACATC AGAGA TGCAG GTCTTGCTTC ATTTTCAAC ACAATCAGAT ATGGCATTGA GACTAGAATG GCAGC TCTAA 960 CTCTGTCTAC CCTTAGACCG GATATCAACA GACTCAAGGC ACTGATCGAG TTATA TCTAT 1020 CAAAGGGGCC ACGTGCTCT TTTATATGCA TTTTGAGAGA TCCCGTGCAT GGTGAGTTTG 1080 CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGTT GTACAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTGG 1260 GGGTCACACA AGAAGCCAAG CAAAGCTTGA AGAAACACAT GAAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAACAGA 1380 CAGGGCAGCC TGAATCCAGA GAGAACCAGG ATCAAGGAGA TGAGCCTCGG TCATC CATAG TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACACAG AATGGACATA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGCTCCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACAGACA AATCAAACACA AATCAAACTG 1620 AAAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGC AAACAACAC AATCAAAACTG 1620 AAAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAACACAC AATCAAACTG 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	TTAAATCCAG	TCTAGTGTTG	AGCGGTGATG	CAGTAGA ACA	AATTGGATCA	ATTAT GAGGT	780
GECTTGCTTC ATTITICAAC ACAATCAGAT ATGGCATTGA GACTAGAATG GCAGCTCTAA 960 CTCTGTGTCTAC CCTTAGACCG GATATCAACA GACTCAAAGGC ACTGATCGAG TTATATCTAT 1020 CAAAAGGGGCC ACGTGCTCCT TTTATATGCA TTTTGAGAGA TCCCGTGCAT GGTGAGTTTG 1080 CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGAT GGTGAGGTTTG TACAAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTG 1260 GGGTCAACACA AGAAGCCAAG CAAAGCTTGA AGAAACACAT GAAGAACAT AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAACAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATC CATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCAGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAAGCAT CAAAACTGAA CAAAGAAACA TCAAGGAGA TGAGCATCAA ACTACAGAAA 1500 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACAATCA AACTGAACAA AGCACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACAA AATCAAACTG 1620 AAATAGAATGA TTTGTTCAGT GCATTCGGAA GCAACTAGC ACAAACACAA AATCAAACTG 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	CCCAACAGAG	CTTGGTAACA	CTCATGGTTG	AAACACT GAT	AACAATGAAC	ACAGG CAGGA	840
CTCTGTCTAC CCTTAGACCG GATATCAACA GACTCAAGGC ACTGATCGAG TTATATCTAT 1020 CAAAGGGGCC ACGTGCTCCT TTTATATGCA TTTTGAGAGA TCCCGTGCAT GGTGAGTTTG 1080 CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGTT GTACAAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAAAT TCTCCAACTTG 1200 GTCAAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTGG 1260 GGGTCACACA AGAAGCCAAG CAAAGCTTGA AGAAACACAT GAAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAAGAAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATC CATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCAGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCA AAACAACAA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGT CACAAAGAGA AATCAAACTG 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	ATGATCTGAC	AACAATAGAA	AAGAATATAC	AGATTGT AGG	AAACTACATC	AGAGA TGCAG	900
CAAAGGGGCC ACGTGCTCCT TITATATGCA TITTGAGAGA TCCCGTGCAT GGTGAGTTTG 1080 CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGTT GTACAAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTGG 1260 GGGTCACACA AGAAGCCAAG CAAAGCTTGA AGAAACACAT GAAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAAGAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATCCATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAACACA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCA AAACAACAA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGA GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	GTCTTGCTTC	ATTTTTCAAC	ACAATCAGAT	ATGGCAT TGA	GACTAGAATG	GCAGC TCTAA	960
CACCAGGCAA CTATCCTGCC CTCTGGAGTT ATGCGATGGG TGTAGCAGTT GTACAAACA 1140 AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTGG 1260 GGGTCACACA AGAAGCCAAG CAAAGCTTGA AGAAACACAT GAAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAAGAAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATCCATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACAATCA AACAACACA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	CTCTGTCTAC	CCTTAGACCG	GATATCAACA	GACTCAA GGC	ACTGATCGAG	TTATA TCTAT	1020
AGGCCATGCA ACAGTATGTA ACAGGAAGGT CTTATCTGGA TATTGAAATG TTCCAACTTG 1200 GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTGG 1260 GGGTCACACA AGAAGCCAAG CAAAGCTTGA AGAAACACAT GAAGAACACT AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAAGAAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATC CATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACT CAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACACA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	CAAAGGGGCC	ACGTGCTCCT	TTTATATGCA	TTTTGAGAG A	TCCCGTGCAT	GGTGAGT TTG	1080
GTCAAGCAGT GGCACGTGAT GCCGAGTCGC AGATGAGTTC AATATTAGAG GATGAACTGG 1260 GGGTCACACA AGAAGCCAAG CAAAGCTTGA AGAAACACT GAAGAACATC AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAAGAAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATC CATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCA AAACAACAA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	CACCAGGCAA	CTATCCTGCC	CTCTGGAGTT	ATGCGAT GGG	TGTAGCAGTT	GTACA AAACA	1140
AGAGCCACA AGAAGCCAAG CAAAGCTTGA AGAAACACT GAAGAACAT AGCAGTTCAG 1320 ATACAACCTT TCATAAGCCT ACAGGGGGAT CAGCCATAGA AATGGCGATA GATGAAGAAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATCCATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCA AAACAACACA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	AGGCCATGCA	ACAGTATGTA	ACAGGAAGGT	CTTATCT GGA	TATTGAAATG	TTCCA ACTTG	1200
ATACAACCTT TCATAAGCCT ACAGGGGAT CAGCCATAGA AATGGCGATA GATGAAGAAG 1380 CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATCCATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACACA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	GTCAAGCAGT	GGCACGTGA T	GCCGAGTCGC	AGATGAG TTC	AATATTAGAG	GATGAACTGG	1260
CAGGGCAGCC TGAATCCAGA GGAGATCAGG ATCAAGGAGA TGAGCCTCGG TCATCCATAG 1440 TTCCTTATGC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACACA AATCAAACTG 1620 AAAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	GGGTCACACA	AGAAGCCAAG	CAAAGCTTGA	AGAAACA CAT	GAAGAACATC	AGCAG TTCAG	1320
TTCCTTATEC ATGGGCAGAC GAAACCGGGA ATGACAATCA AACTGAATCA ACTACAGAAA 1500 TTGACAGCAT CAAAACTGAA CAAAGAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACACA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	ATACAACCTT	TCATAAGCC T	ACAGGGGGAT	CAGCCAT AGA	AATGGCGATA	GATGA AGAAG	1380
TTGACAGCAT CAAAACTGAA CAAAGAAACA TCAGAGACAG GCTGAACAAA AGACTCAACG 1560 AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACACA AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	CAGGGCAGCC	TGAATCCAGA	GGAGATCAGG	ATCAAGG AGA	TGAGCCTCGG	TCATC CATAG	1440
AGAAAAGGAA ACAGAGTGAC CCGAGATCAA CTGACATCAC AAACAACAC AATCAAACTG 1620 AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	TTCCTTATGC	ATGGGCAGAC	GAAACCGGGA	ATG ACAATCA	AACTGAATCA	A CTACAGAAA	1500
AAATAGATGA TTTGTTCAGT GCATTCGGAA GCAACTAGTC ACAAAGAGAT GACCACTATC 1680 ACCAGCAACA AGTAAGAAAA ACTTAGGAT AATGGAAATT ATCCAATCCA	TTGACAGCAT	CAAAACTGAA	CAAAGAAACA	TCAGAGA CAG	GCTGAACAAA	AGACT CAACG	1560
ACCAGCAACA AGTAAGAAAA ACTTAGGATT AATGGAAATT ATCCAATCCA	AGAAAAGGAA	ACAGAGTGAC	CCGAGATCAA	CTGACAT CAC	AAACAACACA	AATCA AACTG	1620
GACAAATCCA GAATCCAACC ACAACTCAAT CAACCAAAGA TTCATGGAAG ACAATGTTCA 1800 AAACAATCAA ATCATGGATT CTTGGGAAGA GGGATCAGGA GATAAATCAT CTGACATCTC 1860 ATCGGCCCTC GACATCATTG AATTCATACT CAGCACCGAC TCCCAAGAAA ACACGGCAGA 1920 CAGCAATGAA ATCAACACAG GAACCACAAG ACTTAGCACG ACAATCTACC AACCTGAATC 1980 CAAAACAACA GAAACAAGCA AGGAAAATAG TGGACCAGCT AACAAAAATC GACAGTTTGG 2040 GGCATCACAC GAACGTGCCA CAGAGACAAA AGATAGAAAT GTTAATCAGG AGACTGTACA 2100 GGGAGGATAT AGGAGAGGAA GCAGCCCAGA TAGTAGAACT GAGACTATGG TCACTCGAAG 2160 AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA 2220 CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAAG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	AAATAGATGA	TTTGTTCAGT	GCATTCGGAA	GCAACTA GTC	ACAAAGAGAT	GACCACTATC	1 680
AAACAATCAA ATCATGGATT CTTGGGAAGA GGGATCAGGA GATAAATCAT CTGACATCTC 1860 ATCGGCCCTC GACATCATTG AATTCATACT CAGCACCGAC TCCCAAGAAA ACACGGCAGA 1920 CAGCAATGAA ATCAACACAG GAACCACAAG ACTTAGCACG ACAATCTACC AACCTGAATC 1980 CAAAACAACA GAAACAAGCA AGGAAAATAG TGGACCAGCT AACAAAAATC GACAGTTTGG 2040 GGCATCACAC GAACGTGCCA CAGAGACAAA AGATAGAAAT GTTAATCAGG AGACTGTACA 2100 GGGAGGATAT AGGAGAGGAA GCAGCCCAGA TAGTAGAACT GAGACTATGG TCACTCGAAG 2160 AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA 2220 CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAGG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	ACCAGCAACA	AGTAAGAAAA	ACTTAGGATT	AATGGAA ATT	ATCCAATCCA	GAGAC GGAAG	1740
ATCGGCCCTC GACATCATTG AATTCATACT CAGCACCGAC TCCCAAGAAA ACACGGCAGA 1920 CAGCAATGAA ATCAACACAG GAACCACAAG ACTTAGCACG ACAATCTACC AACCTGAATC 1980 CAAAACAACA GAAACAAGCA AGGAAAATAG TGGACCAGCT AACAAAAAATC GACAGTTTGG 2040 GGCATCACAC GAACGTGCCA CAGAGACAAA AGATAGAAAAT GTTAATCAGG AGACTGTACA 2100 GGGAGGATAT AGGAGAGGAA GCAGCCCAGA TAGTAGAACT GAGACTATGG TCACTCGAAG 2160 AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA 2220 CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAGG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	GACAAATCCA	GAATCCAACC	ACAACTCAAT	CAACCAA AGA	TTCATGGAAG	ACAAT GTTCA	1800
CAGCAATGAA ATCAACACA GAACCACAAG ACTTAGCACG ACAATCTACC AACCTGAATC 1980 CAAAACAACA GAAACAAGCA AGGAAAATAG TGGACCAGCT AACAAAAATC GACAGTTTGG 2040 GGCATCACAC GAACGTGCCA CAGAGACAAA AGATAGAAAT GTTAATCAGG AGACTGTACA 2100 GGGAGGATAT AGGAGAGGAA GCAGCCCAGA TAGTAGAACT GAGACTATGG TCACTCGAAG 2160 AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA 2220 CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAAG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	AAACAATCAA	ATCATGGAT T	CTTGGGAAGA	GGGATCA GGA	GATAAATCAT	CTGAC ATCTC	1860
CAAAACAACA GAAACAAGCA AGGAAAATAG TGGACCAGCT AACAAAAATC GACAGTTTGG 2040 GGCATCACAC GAACGTGCCA CAGAGACAAA AGATAGAAAT GTTAATCAGG AGACTGTACA 2100 GGGAGGATAT AGGAGAGGAA GCAGCCCAGA TAGTAGAACT GAGACTATGG TCACTCGAAG 2160 AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA 2220 CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAAG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	ATCGGCCCTC	GACATCATTG	AATTCATACT	CAGCACCGAC	TCCCAA GAAA	ACACGGCAGA	1 920
GGCATCACAC GAACGTGCCA CAGAGACAAA AGATAGAAAT GTTAATCAGG AGACTGTACA 2100 GGGAGGATAT AGGAGAGGAA GCAGCCCAGA TAGTAGAACT GAGACTATGG TCACTCGAAG 2160 AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA 2220 CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAAGG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	CAGCAATGAA	ATCAACACAG	GAACCACAAG	ACTTAGC ACG	ACAATCTACC	AACCT GAATC	1980
GGGAGGATAT AGGAGAGGAA GCAGCCCAGA TAGTAGAACT GAGACTATGG TCACT CGAAG 2160 AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA 2220 CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAAG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	CAAAACAACA	GAAACAAGCA	AGGAAAATAG	TGGACCA GCT	AACAAAAATC	GACAG TTTGG	2040
AATCTCCAGA AGCAGCCCAG ATCCTAACAA TGGAACCCAA ATCCAGGAAG ATATTGATTA 2220 CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAGG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	GGCATCACAC	GAACGTGCCA	CAGAGACAAA	AGATAGA AAT	GTTAATCAGG	AGACTGTAC A	2100
CAATGAAGTT GGAGAGATGG ATAAGGACTC TACTAAGAGG GAAATGCGAC AATTTAAAGA 2280 TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	GGGAGGATAT	AGGAGAGGAA	GCAGCCCAGA	TAGTAGA ACT	GAGACTATGG	TCACT CGAAG	2160
TGTTCCAGTC AAGGTATCAG GAAGTGATGC CATTCCTCCA ACAAAACAAG ATGGAGACGG 2340	AATCTCCAGA	AGCAGCCCAG	ATCCTAACAA	TGGAACC CAA	ATCCAGGAAG	ATATT GATTA	2220
ANTA ANTA ANTA ANTA ANTA ANTA ANTA ANTA	CAATGAAGTT	GGAGAGATGG	ATAAGGACTC	TACTAAG AGG	GAAATGCGAC	AATTT AAAGA	2280
7350	TGTTCCAGTC	AAGGTATCAG	GA AGTGATGC	CATTCCTCCA	ACAAAACAAG	ATGGAGACGG	2340
IGAIGAIGA	TGATGATGGA	•					2350

Docket No.: NIH 0127 Inventor: Mario H. Skiadopoulos et al.

Title: ATTENUATED HUMAN-BOVINE CHIMERIC PARAINFLUENZA VIRUS (PI

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Serial No.: 09/900,112 Filing Date: July 5, 2001

SEQ ID NO: 36

AGAGGCCTGG AATCTATCAG TACATTTGAT TCAGGATATA CCAGTATAGT GACTGCCGCA 2410 ACACTAGATG ACGAAGAAGA ACTCCTTATG AAGAACAACA GGCCAAGAAA GTATCAATCA 2470 ACACCCCAGA ACAGTGACAA GGGAATTAAA AAAGGGGTTG GAAGGCCAAA AGACA CAGAC 2530 AAACAATCAT CAATATTGGA CTACGAACTC AACTTCAAAG GATCGAAGAA GAGCCAGAAA 2590 ATCCTCAAAG CCAGCACGAA TACAGGAGAA CCAACAAGAC CACAGAATGG ATCCCAGGGG 2650 AAGAGAATCA CATCCTGGAA CATCCTCAAC AGCGAGAGCG GCAATCGAAC AGAATCAACA 2710 AACCAAACCC ATCAGACATC AACCTCGGGA CAGAACCACA CAATGGGACC AAGCAGAACA 2770 ACCTCCGAAC CAAGGATCAA GACACAAAAG ACGGATGGAA AGGAAAGAGA GGACA CAGAA 2830 GAGAGCACTC GATTTACAGA AAGGGCGATT ACATTATTAC AGAATCTTGG TGTAATCCAA 2890 TCTGCAGCAA AATTAGACCT ATACCAAGAC AAGAGAGTTG TGTGTGTGGC GAATGTCCTA 2950 AACAATGCAG ATACTGCATC AAAGATAGAC TTCCTAGCAG GTTTGATGAT AGGAGTGTCA 3010 ATGGATCATG ATACCAAATT AAATCAGATT CAGAACGAGA TATTAAGTTT GAAAACTGAT 3070 CTTAAAAAGA TGGATGAATC ACATAGAAGA CTAATTGAGA ATCAAAAAGA ACAAT TATCA 3130 CTGATCACAT CATTAATCTC AAATCTTAAA ATTATGACAG AGAGAGGAGG GAAGAAGGAC 3190 CAACCAGAAC CTAGCGGGAG GACATCCATG ATCAAGACAA AAGCAAAAGA AGAGAAAATA 3250 1 AAGAAAGTCA GGTTTGACCC TCTTATGGAA ACACAGGGCA TCGAGAAAAA CATCCCTGAC 3310 CTCTATAGAT CAATAGAGAA AACACCAGAA AACGACACAC AGATCAAATC AGAAA TAAAC 3370 AGATTGAATG ATGAATCCAA TGCCACTAGA TTAGTACCTA GAAGAATAAG CAGTACAATG 3430 AGATCATTAA TAATAATCAT TAACAACAGC AATTTATCAT CAAAAGCAAA GCAATCATAC 3490 ATCAACGAAC TCAAGCTCTG CAAGAGTGAC GAGGAAGTGT CTGAGTTGAT GGACATGTTC 3550 AATGAGGATG TCAGCTCCCA GTAAACCGCC AACCAAGGGT CAACACCAAG AAAACCAATA 3610 GCACAAAACA GCCAATCAGA GACCACCCCA ATACACCAAA CCAATCAACA CATAACAAAG 3670 ATCTCCAGAT CATAGATGAT TAAGAAAAAC TTAGGATGAA AGGACTAATC AATCCTCCGA 3730 AACAATGAGC ATCACCAACT CCACAATCTA CACATTCCCA GAATCCTCTT TCTCCGAGAA 3790 TGGCAACATA GAGCCGTTAC CACTCAAGGT CAATGAACAG AGAAAGGCCA TACCTCATAT 3850 TAGGGTTGTC AAGATAGGAG ATCCGCCCAA ACATGGATCC AGATATCTGG ATGTCTTTTT 3910 ACTGGGCTTC TTTGAGATGG AAAGGTCAAA AGACAGGTAT GGGAGCATAA GTGATCTAGA 3970 TGATGATCCA AGTTACAAGG TTTGTGGCTC TGGATCATTG CCACTTGGGT TGGCTAGATA 4030 CACCGGAAAT GATCAGGAAC TCCTACAGGC TGCAACCAAG CTCGATATAG AAGTAAGAAG 4090 AACTGTAAAG GCTACGGAGA TGATAGTTTA CACTGTACAA AACATCAAAC CTGAACTATA 4150 TCCATGGTCC AGTAGATTAA GAAAAGGGAT GTTATTTGAC GCTAATAAGG TTGCACTTGC 4210 TCCTCAATGT CTTCCACTAG ATAGAGGGAT AAAATTCAGG GTGATATTTG TGAACTGCAC 4270 AGCAATTGGA TCAATAACTC TATTCAAAAT CCCTAAGTCC ATGGCATTGT TATCATTGCC 4330 TAATACAATA TCAATAAATC TACAAGTACA TATCAAAACA GGAGTTCAGA CAGATTCCAA 4390 AGGAGTAGTT CAGATTCTAG ATGAAAAAGG TGAAAAATCA CTAAATTTCA TGGTTCATCT 4450 CGGGTTGATC AAAAGGAAGA TGGGCAGAAT GTACTCAGTT GAATATTGTA AGCAGAAGAT 4510 CGAGAAGATG AGATTATTAT TCTCATTGGG ATTAGTTGGA GGGATCAGCT TCCACGTCAA 4570 CGCAACTGGC TCTATATCAA AGACATTAGC AAGTCAATTA GCATTCAAAA GAGAAATCTG 4630 CTATCCCCTA ATGGATCTGA ATCCACACTT AAATTCAGTT ATATGGGCAT CATCAGTTGA 4690 4700-AATTACAAGG

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Inventor: Mario H. Skiadopoulos et all little: ATTENUATED HUMAN-BOVINE
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GTAGATGCAG	TTCTCCAGCC	TTCATTACCT	GGCGAAT TCA	GATACTACCC	AAACA TCATA	4760
GCAAAAGGGG	TCGGGAAAA T	CAGACAGTAA	AATCAAC AAC	CCTGATATCC	AACAT TGCAA	4820
ATCAGGCTAC	CCACAGGAGA	AAAATCAAAA	ACTTAGG ATC	AAAGGGATCA	CCACG AACCC	4880
CGGAAAACAG	CCAAACAAAC	CAACACACAA	ATCA CAGACA	AAAAGGAGAA	GG CACTGCAA	4940
AGACCGAGAA	AAAACAGAA C	GCACACAACC	AAGCAGA GAA	AAGCCAAAGC	CCGCC ATTCA	5000
CAAACACACC	AACAATCCTG	CAAACAAGCA	CCAAAAC AGA	GGTCAAAAGA	CAAAG AGCAC	5060
CAGATATGAC	CATCACAACC	ACAATCATAG	CCATATT ACT	AATACCCCCA	TCATT TTGTC	5120
AAATAGACAT	AACAAAACTG	CAACGTGTAG	GTGTGTT AGT	CAACAATCCT	AAAGG CATGA	5180
AGATTTCACA	AAATTTCGAA	ACGAGATACC	TGATATT AAG	TTTGATACCC	AAAAT AGAGA	5240
ATTCACACTC	atgtgggat	CAACAGATAA	ACCAATA CAA	GAAGTTATTG	GATAG ATTGA	5300
TAATTCCTCT	ATATGATGG A	TTAAAATTAC	AAAA AGATGT	AATAGTAGTA	AG TCATGAAA	5360
CCCACAACAA	TACTAATCT T	AGGACAAAAC	GATTCTT TGG	AGAGATAATT	GGGAC AATTG	5420
CGATAGGGAT	AGCCACTTCA	GCACAAATCA	CCGCAGC AGT	CGCTCTTGTC	GAAGC TAAAC	5480
AGGCAAAGTC	AGACATAGAA	AAACTCAAAG	AGGCTAT AAG	AGACACAAAC	AAGGC AGTAC	5540
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TATCATACAA	CATCCAGGGC	AAAGAGTGGT	ATATTCCTC T	TCCCAATCAC	ATCATGA CAA	6020
AAGGGGCTTT	TCTAGGTGG T	GCTGATATTA	AAGAATG CAT	AGAGGCATTC	AGCAG TTATA	6080
TATGTCCTTC	TGATCCAGG T	TACATATTAA	ATCACGA GAT	AGAGAATTGT	TTATC AGGGA	6140
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GACAATAAGA	CTATACACGA	TCAAATATAA	AAAGTACAAA	AAACTTAGGA	ACAAA GTTGT	6740
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GAGGCAAACA	TAGTAGCAAG	GTTACAAATA	TCATAAT GTA	CACCTTCTGG	ACAAT AACAT	6920
TAACAATATT	ATCAGTCAT T	TTTATAATGA	TATTGAC AAA	CTTAATTCAA	GAGAA CAATC	6980
ATAATAAATT	AATGTTGCAG	GAAATAAGAA	AAGAATT CGC	GGCAATAGAC	ACCAAG ATTC	7040
AGAGGACTTC						7050

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GGATGACATT	GGAACCTCAA	TACAGTCAGG	AATAAAT ACA	AGACTTCTCA	CAATT CAGAG	7110
TCATGTTCAA	AACTATATCC	CACTATCATT	AACACAA CAA	ATGTCAGATC	TCAGA AAATT	7170
TATCAATGAT	CTAACAAATA	AAAGAGAACA	TCAAGAA GTG	CCAATACAGA	GAATGACTCA	7230
TGATAGAGGT	ATAGAACCCC	TAAATCCAAA	CAAGTT CTGG	AGGTGTACAT	CTGG TAACCC	7290
ATCTCTAACA	AGTAGTCCT A	AGATAAGGTT	AATACCA GGA	CCAGGTTTAT	TAGCAACATC	7350
TACTACAGTA	AATGGCTGT A	TTAGAATTCC	ATCGTTAGTA	ATCAATCATC	TAATC TATGC	7410
TTACACCTCT	AATCTTATTA	CCCAGGGCTG	TCAAGAT ATA	GGGAAATCTT	ACCAA GTACT	7470
ACAAATAGGG	ATAATTACTA	TAAAT TCGGA	CCTAGTACCT	GAT TTAAACC	CCAGAGTCAC	7530
ACATACATTT	AATATTGAT G	ATAATAGAAG	ATCTTGC TCT	CTGGCACTAT	TGAAT ACAGA	7590
TGTTTATCAG	TTATGCTCAA	CACCAAAAGT	TGATGAA AGA	TCCGATTATG	CATCA ACAGG	7650
TATTGAGGAT	ATTGTACTTG	ACATTGTCAC	TAATAAT GGA	TTAATTATAA	CAACAAGGTT	7710
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TTATTGGGGA	TCAGAAGGAA	GATTACTTTT	ATTAGGT GAC	AGAATATACA	TATAT ACTAG	8070
ATCCACAAGT	TGGCACAGT A	AATTACAGTT	AGGGGTA ATT	GATATTTCTG	ATTATACTAA	8130
TATAAGAATA	aattggact t	GGCATAATGT	ACTATCA CGG	CCAGGGAATG	ATGAA TGTCC	8190
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AAACCCATCG	GGGAGTGTT G	TATCATCAGT	AATTCTT GAT	TCACAAAAGT	CTAGA GAAAA	8310
CCCAATCATT	ACTTACTCAA	CAGCTACAAA	TAGAATAAAT	GAATTAGCTA	TATATAACAG	8370
AACACTTCCA	GCTGCATATA	CAACAACAAA	TTGTATC ACA	CATTATGATA	AAGGG TATTG	8430
TTTTCATATA	GTAGAAATAA	ATCACAGAAG	TTTGAAT ACG	TTTCAACCTA	TGTTA TTCAA	8490
AACAGAAGTT	CCAAAAAACT	GCAGCTAAAT	TGATCAT CGC	ATATCGGATG	CAAGA TGACA	8550
TTAAAAGAGA	CCACCAGACA	GACAACACAG	GAGACGA TGC	AAGATATAAA	GAAAT AATAA	8610
AAAACTTAGG	agaaaagtg t	GCAAGAAAA	TGGACAC CGA	GTCCCACAGC	GGCAC AACAT	8670
CTGACATTCT	GTACCCTGAA	TGTCACCTCA	ATTCTCC TAT	AGTTAAAGGA	AAGAT AGCAC	8730
AACTGCATAC	aataatgag t	TTGCCTCAGC	CCTACGATAT	GGATGAT GAT	TCAATACTGA	8790
TTATTACTAG	ACAAAAAATT	AAACTCAATA	AATTAGA TAA	AAGACAACGG	TCAAT TAGGA	8850
AATTAAGATC	AGTCTTAATG	GAAAGAGTAA	GTGATCT AGG	TAAATATACC	TTTAT CAGAT	8910
ATCCAGAGAT	GTCTAGTGAA	ATGTTCCAAT	TATGTAT ACC	CGGAATTAAT	AATAA AATAA	8970
ATGAATTGCT	AAGTAAAGCA	AGTAAAACAT	ATAATCA AAT	GACTGATGGA	TTAAG AGATC	9030
TATGGGTTAC	TATACTATCG	AAGTTAGCAT	CGAAAAA TGA	TGGAAGTAAT	TATGA TATCA	9090
ATGAAGATAT	TAGCAATATA	TCAAATGTTC	ACATGAC TTA	TCAATCAGAC	AAATGGTATA	9150
ATCCATTCAA	GACATGGTT T	ACTATTAAGT	ATGAC ATGAG	AAGATTACAA	AAAGCCAAAA	9210
ATGAGATTAC	ATTCAATAGG	CATAAAGATT	· ATAATCT ATT	AGAAGACCAA	AAGAA TATAT	9270
TGCTGATACA	TCCAGAACTC	GTCTTAATAT	TAGATAA ACA	AAATTACAAT	GGGTA TATAA	9330
TGACTCCTGA	ATTGGTACTA	ATGTATTGTG	ATGTAGT TGA	AGGGAGGTGG	AATAT AAGTT	9390
CATGTGCAAA						9400

Docket No.: NIII-0127
Inventor: Mario H. Skiadopoulos et al.

Title: ATTENUATED HUMAN-BOVINE
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ATTGGATCCT	AAGTTACAAT	CAATGTATTA	TAAGGGT AAC	AATTTATGGG	AAATA ATAGA	9460
TGGACTATTC	TCGACCTTAG	GAGAAAGAAC	ATTTGAC ATA	ATATCACTAT	TAGAA CCACT	9520
TGCATTATCG	CTCATTCAAA	CTTATGACCC	GGTTAAA CAG	CTCAGGGGGG	CTTTT TTAAA	9580
TCACGTGTTA	TCAGAAATGG	AATTAATATT	TGCAGC TGAG	TGTACAACAG	AGGA AATACC	9640
TAATGTGGAT	TATATAGATA	AAATTTTAGA	TGTGTTC AAA	GAATCAACAA	TAGAT GAAAT	9700
AGCAGAAATT	TTCTCTTTCT	TCCGAACTTT	TGGACAC CCT	CCATTAGAGG	CGAGT ATAGC	9760
AGCAGAGAAA	GTTAGAAAGT	ATATGTATAC	TGAGAAA TGC	TTGAAATTTG	ATACT ATCAA	9820
TAAATGTCAT	GCTATTTTT	GTACA ATAAT	TATAAATGGA	TAT AGAGAAA	GACATGGTGG	9880
TCAATGGCCT	CCAGTTACAT	TACCTGTCCA	TGCACAT GAA	TTTATCATAA	ATGCA TACGG	9940
ATCAAATTCT	GCCATATCAT	ATGAGAATGC	TGTAGAT TAT	TATAAGAGCT	TCATA GGAAT	10000
AAAATTTGAC	AAGTTTATAG	AGCCTCAATT	GGATGAA GAC	TTAACTATTT	ATATGAAAGA	10060
TAAAGCATTA	TCCCCAAAGA	AATCAAACTG	GGACACA GTC	TATCCAGCTT	CAAACCTGTT	10120
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TAAATTTGAT	CCCCACCAAG	TATTAGATTA	CGTAGAA TCA	GGATATTGGC	TGGAT GATCC	10240
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TGCAAAAATG	ACATACAAGA	TGAGGGCTAC	ACAAGTA TTA	TCAGAAACAT	TATTG GCGAA	10360
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GAGACTAACA	ACAATATCTA	TGTCTGGAGT	TCCGCGG TAT	AATGAGGTAT	ACAATAATTC	10480
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GGGTCATGAG	CTCAAACTAA	atgaaact at	AATAAGTAGT	AAAATG TTTA	TATATAGCAA	11140
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GTTTGCAAAG	GCCATTGAGA	ATGGCTACTC	ACCTGTA TTG	GGATATGTAT	GCTCAATCTT	11320
CAAAAATATC	CAACAGTTGT	ATATAGCGCT	TGGAATG AAT	ATAAACCCAA	CTATAACCCA	11380
AAATATTAAA	GATCAATAT T	TCAGGAATAT	TCATTGGATG	CAATATGCCT	CCTTAATCCC	11440
TGCTAGTGTC	ggaggattta	ATTATATGGC	CATGTCA AGG	TGTTTTGTCA	GAAAC ATTGG	11500
AGATCCTACA	GTCGCTGCGT	TAGCCGATA T	TAAAAGATTT	ATAAAAG CAA	ATTTGTTAGA	11560
TCGAGGTGTC	CTTTACAGAA	TTATGAATCA	AGAACCA GGC	GAGTCTTCTT	TTTTA GACTG	11620
GGCCTCAGAT	CCCTATTCAT	GTAACTTACC	ACAATCT CAA	AATATAACCA	CCATG ATAAA	11680
GAATATAACT	GCAAGAAATG	TACTACAGGA	CTCACCA AAC	CCAT TACTAT	CTGGATTATT	11740
TACAAGTACA						11750

Decket No.: NIII-0127

Inventor: Mario H. Skiadopoulos et al.

itle: ATTENUATED HUMAN-BOVINE HIMERIC PARAINFLUENZA VIRUS (PIV)

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ATGATAGAAG AGGATGAGGA ATTAGCTGAG TTCCTAATGG ACAGGAGAAT AATCCTCCCA AGAGTTGCAC ATGACATTTT AGATAATTCT CTTACTGGAA TTAGGAATGC TATAGCTGGT 11870 ATGTTGGATA CAACAAAATC ACTAATTCGA GTAGGGATAA GCAGAGGAGG ATTAACCTAT AACTTATTAA GAAAGATAAG CAACTATGAT CTTGTACAAT ATGAGACACT TAGTAAAACT 11990 TTAAGACTAA TAGTCAGTGA CAAGATTAAG TATGAAGATA TGTGCTCAGT AGACCTAGCC 12050 ATATCATTAA GACAAAAAT GTGGATGCAT TTATCAGGAG GAAGAATGAT AAATGGACTT 12110 GAAACTCCAG ATCCTTTAGA GTTACTGTCT GGAGTAATAA TAACAGGATC TGAACATTGT 12170 AGGATATGTT ATTCAACTGA AGGTGAAAGC CCATATACAT GGATGTATTT ACCAGGCAAT 12230 CTTAATATAG GATCAGCTGA GACAGGAATA GCATCATTAA GGGTCCCTTA CTTTGGATCA 12290 GTTACAGATG AGAGATCTGA AGCACAATTA GGGTATATCA AAAATCTAAG CAAACCAGCT 12350 AAGGCTGCTA TAAGAATAGC AATGATATAT ACTT GGGCAT TTGGGAATGA CGAAATATCT 12410 TGGATGGAAG CATCACAGAT TGCACAAACA CGTGCAAACT TTACATTGGA TAGCTTAAAG 12470 ATTTTGACAC CAGTGACAAC ATCAACAAAT CTATCACACA GGTTAAAAGA TACTGCTACT 12530 CAGATGAAAT TTTCTAGTAC ATCACTTATT AGAGTAAGCA GGTTCATCAC AATATCTAAT 12590 GATAATATGT CTATTAAAGA AGCAAATGAA ACTAAAGATA CAAATCTTAT TTATCAACAG 12650 GTAATGTTAA CAGGATTAAG TGTATTTGAA TATCTATTTA GGTTAGAGGA GAGTA CAGGA 12710 CATAACCCTA TGGTCATGCA TCTACATATA GAGGATGGAT GTTGTATAAA AGAGAGTTAC 12770 ANTGATGAGC ATATCAATCC GGAGTCTACA TTAGAGTTAA TCAAATACCC TGAGAGTAAT 12830 GAATTTATAT ATGATAAGGA CCCTTTAAAG GATATAGATC TATCAAAATT AATGGTTATA 12890 AGAGATCATT CTTATACAAT TGACATGAAT TACTGGGATG ACACAGATAT TGTACATGCA 12950 ATATCAATAT GTACTGCAGT TACAATAGCA GATACAATGT CGCAGCTAGA TCGGGATAAT 13010 CTTAAGGAGC TGGTTGTGAT TGCAAATGAT GATGATATTA ACAGTCTGAT AACTGAATTT 13070 CTGACCCTAG ATATACTAGT GTTTCTCAAA ACATTTGGAG GGTTACTCGT GAATCAATTT 13130 GCATATACCC TTTATGGATT GAAAATAGAA GGAAGGGATC CCATTTGGGA TTATATAATG 13190 AGAACATTAA AAGACACCTC ACATTCAGTA CTTAAAGTAT TATCTAATGC ACTATCTCAT 13250 CCAAAAGTGT TTAAGAGATT TTGGGATTGT GGAGTTTTGA ATCCTATTTA TGGTCCTAAT 13310 ACTGCTAGTC AAGATCAAGT TAAGCTTGCT CTCTCGATTT GCGAGTACTC CTTGGATCTA 13370 TTTATGAGAG AATGGTTGAA TGGAGCATCA CTTGAGATCT ATATCTGTGA TAGTGACATG 13430 GAAATAGCAA ATGACAGAAG ACAAGCATTT CTCTCAAGAC ATCTTGCCTT TGTGTGTTGT 13490 TTAGCAGAGA TAGCATCTT TGGACCAAAT TTATTAAATC TAACATATCT AGAGAGACTT 13550 GATGAATTAA AACAATACTT AGATCTGAAC ATCAAAGAAG ATCCTACTCT TAAATATGTG 13610 CAAGTATCAG GACTGTTAAT TAAATCATTC CCCTCAACTG TTACGTATGT AAGGAAAACT 13670 GCGATTAAGT ATCTGAGGAT TCGTGGTATT AATCCGCCTG AAACGATTGA AGATTGGGAT 13730 CCCATAGAAG ATGAGAATAT CTTAGACAAT ATTGTTAAAA CTGTAAATGA CAATTGCAGT 13790 GATAATCAAA AGAGAAATAA AAGTAGTTAT TTCTGGGGAT TAGCTCTAAA GAATTATCAA 13850 GTCGTGAAAA TAAGATCCAT AACGAGTGAT TCTGAAGTTA ATGAAGCTTC GAATGTTACT 13910 ACACATGGAA TGACACTTCC TCAGGGAGGA AGTTATCTAT CACATCAGCT GAGGTTATTT 13970 GGAGTAAACA GTACAAGTTG TCTTAAAGCT CTTGAATTAT CACAAATCTT AATGAGGGAA 14030 GTTAAAAAG ATAAAGATAG ACTCTTTTTA GGAGAAGGAG CAGGAGCTAT GTTAGCATGT 14090 14100 TATGATGCTA

Docket No.: NIH 0127

Inventor: Mario H. Skiadopoulos et al.

Title: ATTENUATED HUMAN-BOVINE CHIMERIC PARAINFLUENZA VIRUS (PIV)

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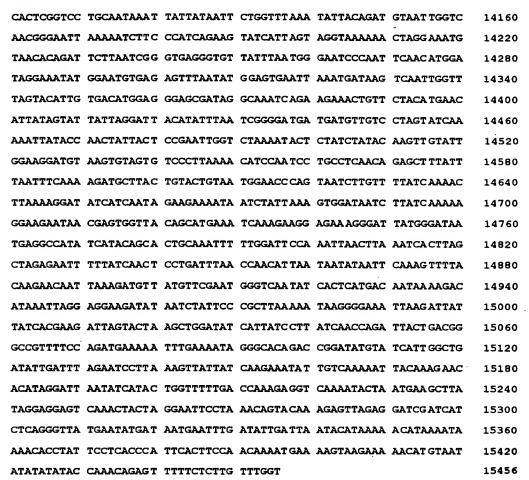


FIGURE 2G



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FIG. 3A

Mutagenesis to create restriction sites at start and stop condons of N

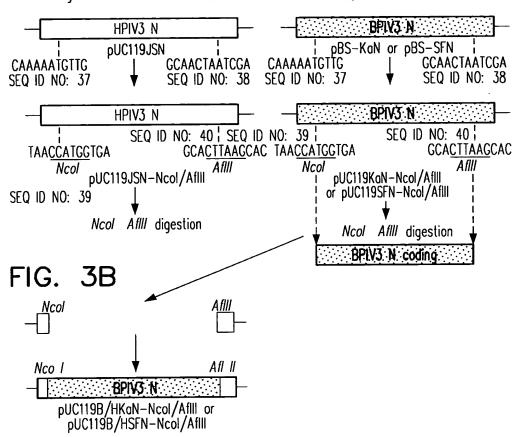
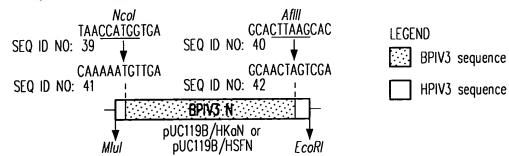
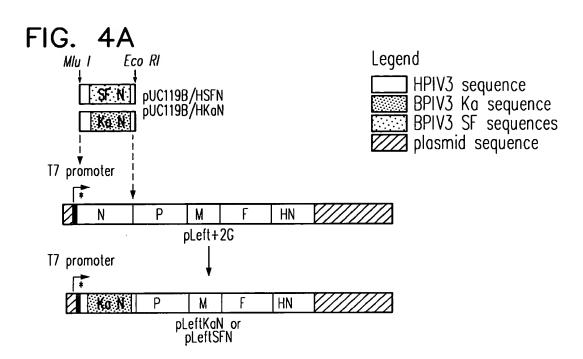


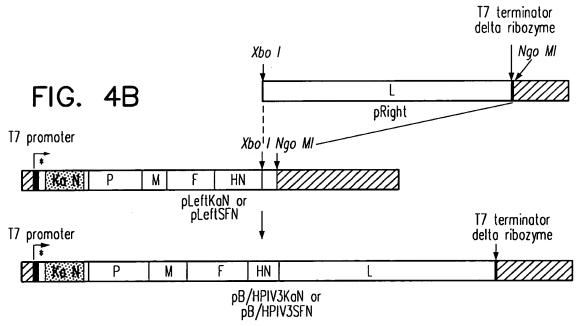
FIG. 3C

Mutagenesis to restore start and stop condon context



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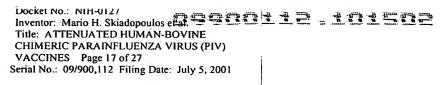


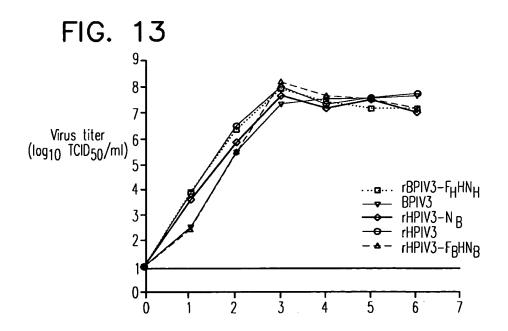


FIG. 5A

SEQ ID NO: 43 SEQ ID NO: 44		GGAACTCTATAATTTCAAAA <u>ATG</u> TTGAGCCTATTTGATAC GGAACTCTATAATTTCAAAAATGTTGAGTCTATTCGACAC
SEQ ID NO: 45 SEQ ID NO: 46	cSF	GGAACTCTATAATTTCAAAAATGTTGAGTCTATTCGACAC GAAATCCTAAGACTGTAATCATGTTGAGTCTATTCGACAC
SEQ ID NO: 47	SF	GAAATCCTAAGACTGTAATC <u>ATG</u> TTGAGTCTATTCGACAC

FIG. 5B

SEQ ID NO: 48	rJS	TTAACGCATTTGGAAGCAAC <u>TAA</u> TCGAATCAACATTTTAA
SEQ ID NO: 49	cKa	TCAGTGCATTCGGAAGCAAC <u>TAG</u> TCGAATCAACATTTTAA
SEQ ID NO: 50	cSF	TCAGTGCATTCGGAAGCAAC <u>TAG</u> TCGAATCAACATTTTAA
SEQ ID NO: 51	Ka	TCAGTGCATTCGGAAGCAAC <u>TAG</u> TCACAAAGAGATGACCA
SEQ ID NO: 52	SF	TCAGTGCATTCGGAAGCAAC <u>TAG</u> TCACAAAGAGATGACCA

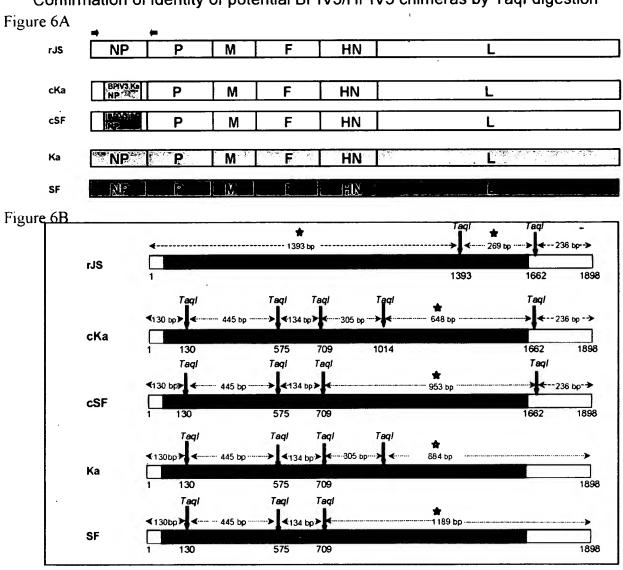


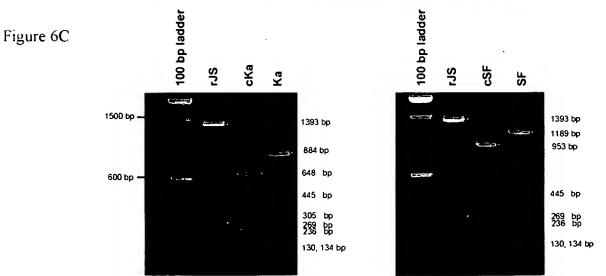
Inventor: Mario H. Skiadopoulos et al. Title: ATTENUATED HUMAN-BOVINE CHIMERIC PARAINFLUENZA VIRUS (PIV)

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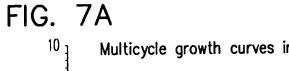


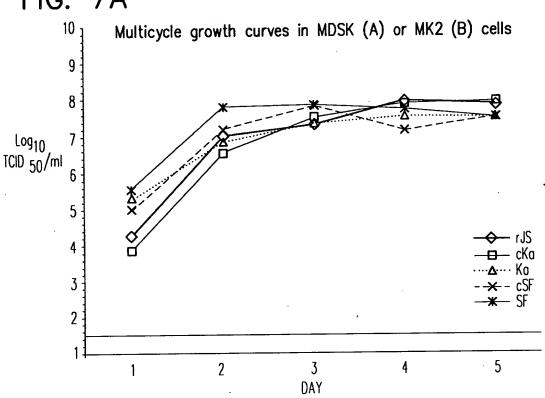


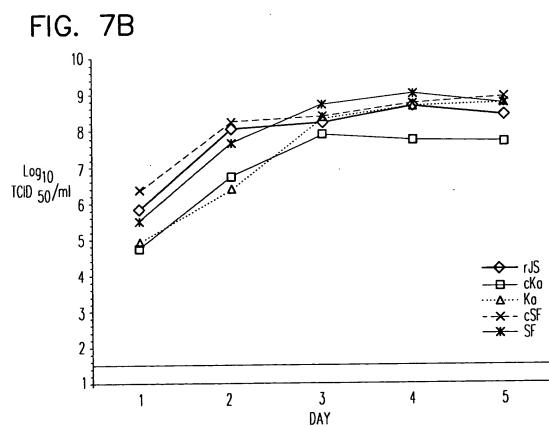
Inventor: Mario H. Skiadopoulos et al.

Title: ATTENHATED HISACCE Title: ATTENUATED HUMAN-BOVINE CHIMERIC PARAINFLUENZA VIRUS (PIV)

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nventor: Mario H. Skiadopoulos et al. tle: ATTENUATED HUMAN-BOVINE

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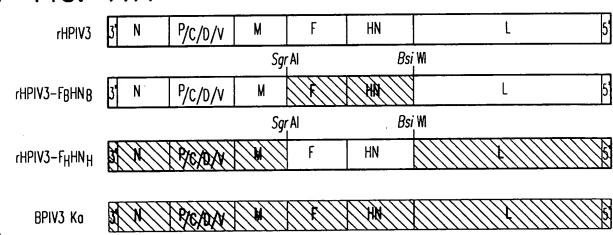
FIG. 8A

5 P/C/D/V М F HN L N rHPIV3 5 F HN L rHPIV3-PB BPIV3

FIG. 8B

P/C/D/V F HN L N M rHPIV3 P/C/D/V HN L rHPIV3-MB BPIV3

FIG. 11A





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Figure 9A

+ - (RT) M 1 2 2027 rHPIV3-PB

Figure 9B

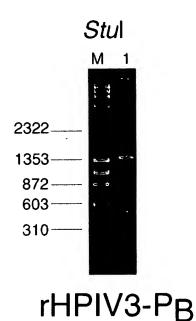
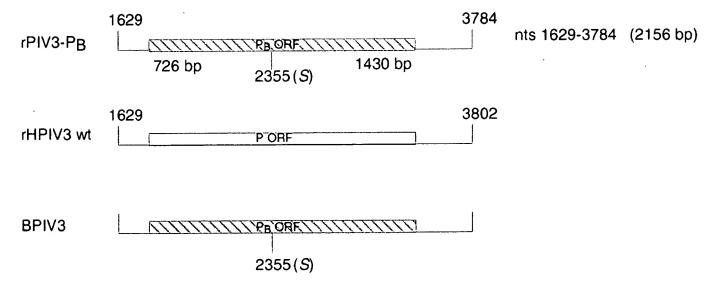


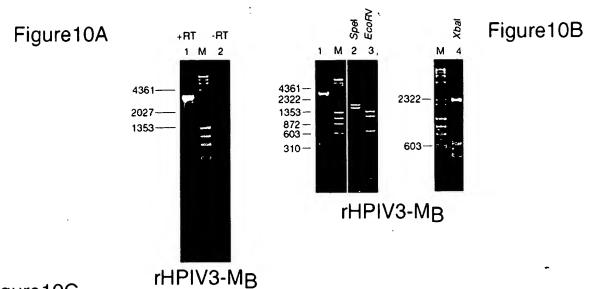
Figure 9C

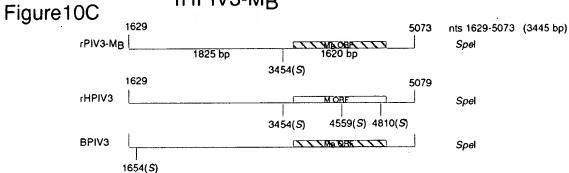


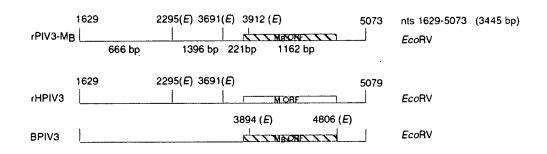
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tor: Mario H. Skiadopoulos et al.
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MERIC PARAINFLUENZA VIRUS (PIV)

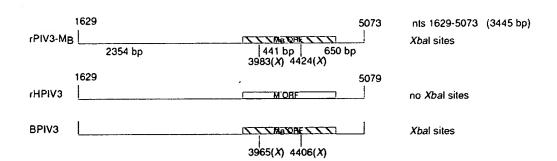
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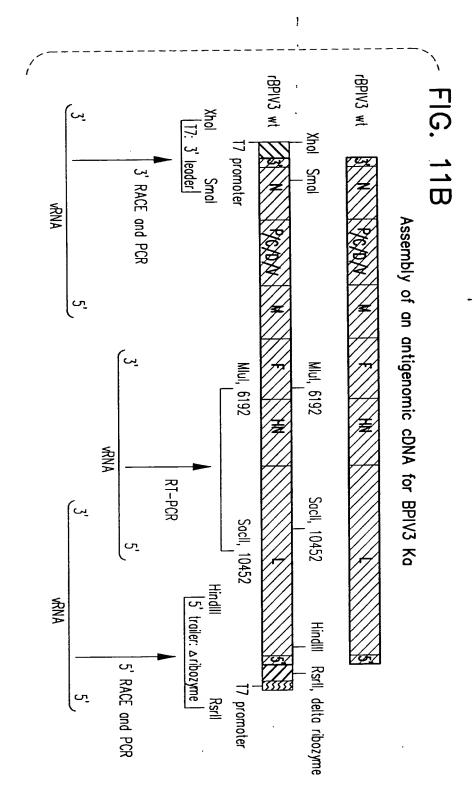








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 ${\sf FIG.}$ 11C Generation of full length cDNA clones encoding HPIV3/BPIV3 antigenic chimeric viruses Generation of HPIV3 and BPIV3 full length clones

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<u></u>	<u>इ</u>	<u>.</u>
HN LAGATATAAAGA SEQ ID NO: 57 8591	Bsi WI HN L AAGACGTACGGA SEQ ID NO: 56	Bsi William L TAGACGTACGGA SEQ ID NO: 60 8973
P/c/b/v M F TCCAACATTGCA 4808	Sgr Al V / C/D/V M F TCCACCGGGCA 4808	SgrAl SgrAl TCCACCGGTGTA 4808
rBPIV3 Ka <mark>bi n</mark> SEQ ID NO: 27	rBPIV3s [3] N SEQ ID NO: 28	гнріv3 Ғ _Н НNн <mark>31</mark> SEQ ID NO: 59
<u>.</u>	<u></u>	<u>.</u>
F HN L TAGACAAAAGGG SEQ ID NO: 53 8597	Mutagenesis to create unique SgrAl and SliW restriction sites SgrAl Bsi WI rHPIV3s SI N P/C/D/V M F HN C EQ ID NO: 30 CGCACCGGTGTA TAGACGTACGGG AR32 R597	
N P/C/D/V M F CGGACGTATCTA 4832	SgrAl SgrAl SgrAl N P/c/b/v M F CGCACCGGTGTA A832	F and HN genes into the PSgrAI N P/C/D/V M E CCCACCGGTGCA 4832
rHPIV3 JS [3] SEQ ID NO: 29	Mutagenesis to a rHPIV3s ST	3. Cloning of the FrHPIV3 FBHNB [3]

Dacket No.: NIII-0127 Inventor: Mario H. Skiadopoulos effet.

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FIG. 14A

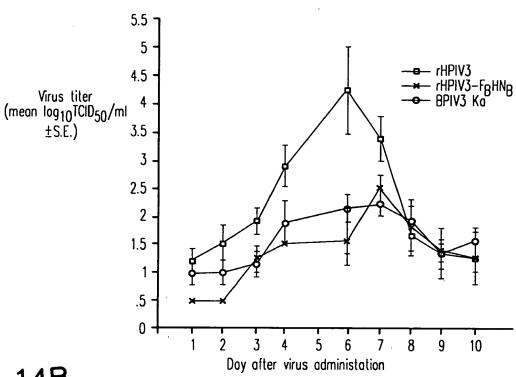
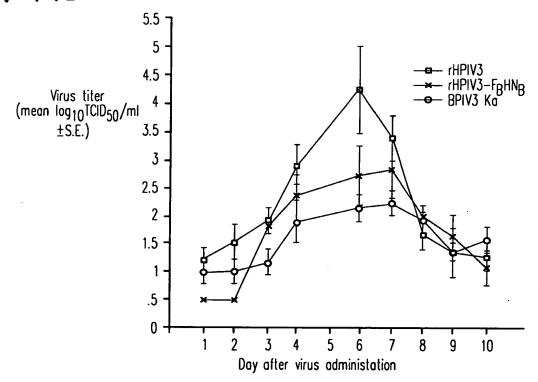


FIG. 14B





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FIG. 15

P/C/D/VrHPIV3 M F HN L rHPIV3 LB P/C/D/V F HN

rBPIV3 Kansas

FIG. 16

L START

SEQ ID NO: 61 rHPIV3 WT 8623 5' TAGGAGCAAAGCGTGCTCGGGAAATGGACACTGAATCTAACA 3' 8664 SEQ ID NO: 62 rHPIV3 LB 8623 5' TAGGAGCAAAGCGTGCTCGGGAAATGGACACCGAGTCCCACA 3' 8664 SEQ ID NO: 63 rBPIV3 wt 8617 5' TAGGAGAAAAGTGTGCAAGAAAAATGGACACCGAGTCCCACA 3' 8658

L STOP

SEQ ID NO: 64 rhpiv3 wt 15325 5' atgatgaatttgatatcgattaaaacataaatacaatgaaga 3' 15366 SEQ ID NO: 65 rhpiv3 bb 15325 5' <u>Ataatgaatttgatattgattaa</u>ta*cgtacg* tacaatgaaga 3' 15366 SEQ ID NO: 66 rbpiv3 wt 15319 5' <u>Ataatgaatttgatattgattaatacataaaaacataaaata</u> 3' 15360